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MB University, Serbia**

In cooperation with:

Faculty of Management University of Warsaw, Poland

Faculty of Law, Economics and Social Sciences Sale - Mohammed V University in Rabat, Morocco

Ecole Nationale de Commerce et de Gestion de Tanger - Abdelmalek Essaadi University, Morocco

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Medimurje University of Applied Sciences in Cakovec, Croatia



Book of Proceedings

127th esd Belgrade 2025

Economic and Social Development in Bipolar and Multipolar Environment

Editors:

Zivanka Miladinovic Bogavac, Nedjo Danilovic, Milos Stankovic, Sandra Raquel Alves



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HOTEL FOOD WASTE MANAGEMENT IN CROATIA

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ABSTRACT

Food waste is a major economic, social and environmental problem. The aim of the paper is to investigate food waste in hotels in Croatia and their awareness of mobile applications as a potential solution for reducing food waste. The research surveyed hotels in Croatia. The results show that the amount of food waste in their operations is significant and the majority of hotels included in the research believe that the state does not sufficiently encourage waste reduction in the hospitality sector. Although Croatia is keeping pace with the regulations of the European Union and striving to achieve the goal of the 2030 Agenda, the existing regulations might not be sufficiently presented to the business sector and households. The results also show that there is significant room for improvement in terms of food donation since the hotels believe that the process of donating food in Croatia is complicated. The results indicate the readiness of hotel management in the sample to innovate their food waste management activities. Hotels have identified mobile platforms as useful solutions that they would likely use. The paper concludes that it is necessary to expand the use of digital solutions for reducing food waste in Croatia.

Keywords: *food waste, hotels, Croatia, mobile platforms, mobile applications*

1. INTRODUCTION

The aim of the paper is to investigate hotel food waste in Croatia. At the European Union level, a series of regulations were adopted in 2018 and 2019 in order to obtain, for the first time, comparable data on the quantities of food waste produced in the Member States, as well as on the methods of food waste management, based on a single methodology. As part of the regulations adopted at the European Union level, the Government of the Republic of Croatia adopted the Plan for the Prevention and Reduction of Food Waste (2019-2022) in 2019 (Government of the Republic of Croatia, 2019). In December 2022, the Plan was continued for the period 2023-2028 (Government of the Republic of Croatia, 2022). Tourism is of great importance for Croatian economy with tourist revenues of 14.6 billion euros in 2023 (19.6% of GDP) (HNB, 2024). It also has a substantial environmental impact. In this study the authors examine hotel food waste management in Croatia. The literature review will present the measures that Croatia has adopted to reduce food waste, with an emphasis on food waste in hotels. In the modern era of digitalization in which we live, mobile platforms are very potent solutions for reducing food waste and will also be presented. After the literature review, the research procedure is described and the research results are presented, followed by the conclusion.

2. LITERATURE REVIEW

Food waste is a global problem, and since it is estimated that as much as one third of the food produced worldwide is thrown away, food waste has been recognized as one of the key problems that needs to be solved in order to achieve sustainability of food production and consumption (Government of the Republic of Croatia, 2022). This amount of wasted food could feed 2 billion people (Ministry of Agriculture, 2021c).

It is estimated that around 88 million tonnes of food, or around 20% of food produced, are wasted annually in the European Union. According to data from the Ministry of Economy and Sustainable Development obtained from the project *Statistical Survey on Food Waste in the Republic of Croatia*, which was conducted in 2021 based on the new methodology for monitoring food waste, 286,379 tonnes of food are wasted annually in the Republic of Croatia, of which the edible part amounts to 106 thousand tonnes (of which 86,726 tonnes relate to households and 19,311 tonnes to the business sector). Food losses and waste occur at all stages of the food production and supply chain, from primary production, processing, distribution, storage, trade, catering and institutional kitchens to households (Ministry of Agriculture, 2021a). Food production is the main driver of global environmental change, as it uses 25% of the total habitable surface area and 70% of the world's drinking water consumption, and is the main cause of land conversion (Ilakovac et al., 2018). Food systems account for as much as a third of European greenhouse gas emissions (Osei-Owusu et al., 2023). It is an absurdity of the modern world that on the one hand, huge amounts of food produced are thrown away, which has significant negative impacts on the environment, society and the economy, and on the other hand, more than a billion people live in extreme poverty. Accordingly, one of the goals of the 2030 Agenda is to halve global food waste per capita at the retail and consumer levels by 2030 and reduce food losses along the food supply chain and production chain, including post-harvest losses (Ministry of Economy and Sustainable Development, 2022). Food loss refers to the reduction in the quantity or quality of food resulting from the decisions and actions of food suppliers in the chain, excluding retailers, caterers, institutional kitchens and consumers. Food loss refers to any food that is discarded, burned or otherwise disposed of, from harvest/slaughter to retail (Ministry of Agriculture, 2021a). Food waste refers to the reduction in the quantity or quality of food that results from the decisions and actions of retailers, caterers, institutional kitchens and consumers (Ministry of Agriculture, 2021a).

2.1. Croatian measures to reduce food waste

In 2022, the Government of the Republic of Croatia adopted the second National Plan for the Prevention and Reduction of Food Waste for the period 2023-2028 (Government of the Republic of Croatia, 2022), which is based on the results and implementation data from the previous Plan. The new plan contains six measures:

1. Encouraging and further improving the food donation system in the Republic of Croatia
2. Encouraging the reduction of food waste
3. Promoting the social responsibility of the food sector
4. Raising awareness and information of consumers on the prevention and reduction of food waste
5. Monitoring the amount of food waste
6. Investing in research and innovative solutions that contribute to the prevention and reduction of food waste

The legislative framework for donating food was improved in 2019, with the adoption of a new Ordinance on donating food and animal feed, which made it possible to donate food after the expiration of the "best before" date (Ministry of Agriculture, 2019). An IT system for donating food (e-donation) was established, i.e. web application of the Ministry of Agriculture, which was developed to improve communication between stakeholders in the food donation system and to redistribute surplus food to those in need more simply and efficiently (Ministry of Agriculture, 2023). A food bank is an organization that collects food from donors intended for the final recipient and gives it to an intermediary in the food donation chain.

A food bank can also give the food collected from donors directly to the final recipient (Ministry of Agriculture, 2022).

Najdonator (eng. *Best Donor*) initiative was launched in 2018 with the goals of promoting socially responsible businesses, recognizing enterprises that regularly donate food and raising awareness about the issue of food donation and waste. The award is given in 3 categories:

- to the large enterprise that donated the most food in total,
- to the large enterprise that donated the most food as a percentage of its annual revenue,
- to the micro/small/medium-sized enterprise that donated the most food as a percentage of its annual revenue (Najdonator, n.d.).

The Ministry of Agriculture has published guides for reducing food waste in primary production, production and processing, retail and catering, and institutional kitchens. The guides emphasize the prerequisites and good practices that can ensure the prevention of unnecessary food waste at individual stages of the food supply chain (Ministry of Agriculture, 2021b).

Unfair trade practices such as last-minute cancellations or changes to orders, late payments for perishable products, short deadlines, etc., negatively affect the economic sustainability of agricultural and food producers, which consequently causes unnecessary food waste. The Act on the Prohibition of Unfair Trading Practices in the Food Supply Chain (Official Gazette, 117/17, 52/21, 27/24), among other things, establishes unfair trading practices in the agricultural and food supply chain and the rules to prevent their imposition. A total of 4,856,113 tons of food were "saved" in the period from 2019 to 2021. When it comes to the amount of food donated through the e-donation information system, it was determined that 215,545 kg of food was donated in the period from 2019 to 2021. In 2021, 165,776 kg of food was donated in the e-donation system, which is 10% of the total food donated in that period. The number of intermediaries in the food donation chain who were registered in the Register of Intermediaries in the period from 2019 to the end of 2021 increased by 24 (Government of the Republic of Croatia, 2022).

In addition to the measures of the Croatian state, the private sector has also recognized the need to reduce food waste. Thus, the company VeeMee d.o.o. has developed a platform to increase the visibility of producers among end consumers and promote the origin of products. The platform offers producers increased production and brand strengthening, suppliers reliable producers and full traceability of goods, and consumers information about the producer and origin of the product (VeeMee, n.d.). By scanning the QR code of a product via smartphone, consumers receive information about the product, producer, certificates and distributors. The VeeMee platform has over 2,000 agricultural farms and covers an area of 30,000 hectares. They have issued over 10,000,000 QR labels and 750 tons of food have been saved. In addition to the platform, VeeMee offers mediation in the transport, sorting, labeling and storage of fruit and vegetables, thus reducing food waste (VeeMee, n.d.).

2.2. Food waste in hotels in Croatia

The Guide to Reducing Food Waste in Hospitality and Institutional Kitchens is intended for restaurants, hotels, canteens in the hospitality sector, and institutional kitchens in hospitals, schools, kindergartens, and universities that also prepare and serve food, but whose primary activity is not catering (Ministry of Agriculture, 2021c).

The most common reasons for food waste in hospitality and institutional kitchens are: difficulties in planning between supply and demand, inappropriate food transportation and storage, excessive storage, discarding edible parts of food during food preparation, inadequate preparation that makes dishes unsuitable for offering to guests, excessive amounts of food prepared considering actual demand, errors in transferring orders from the dining area to the kitchen, leftover food on the guest's plate due to oversized portions (Ministry of Agriculture, 2021c). Ways in which food waste can be reduced in this sector are: determining the person responsible for food procurement and stock control, matching supply with demand, more frequent procurement of smaller quantities of food, procuring food from local producers because this reduces transport time and allows fresh food to have a longer shelf life, respecting quality labels, allowing consumers different portion sizes, designating a person in charge of donating food (Ministry of Agriculture, 2021c).

In 2019, World Wide Fund for Nature (WWF) worked with three hotels (two of them from Croatia) to help them achieve a zero waste strategy. In addition to the Esplanade Hotel in Zagreb, the program was implemented at the Jezero Hotel at Plitvice Lakes and the Courtyard by Marriott Hotel in Belgrade. By implementing the project, the hotels managed to reduce their food waste by 10%-20%. Edible and usable parts are most often discarded due to insufficient culinary knowledge as well as the lack of imagination of the chefs, but this was not the case in the hotels that were monitored. Food was used carefully and very little room for action was found there. In contrast, the place where great savings potential was found is in the area of serving and consuming meals. The amounts of ready-made food in buffets at banquets and breakfasts are points where huge amounts of food are thrown away daily. Through a series of activities, from educating guests when arranging receptions to educating guests with messages and instructions on conscious consumption of dishes on their plates, major savings were achieved in just a few weeks (Tockanai.hr, 2019).

The pilot project "Reduce food waste, cook for your guests" was launched in 2021 by the Environmental Protection and Energy Efficiency Fund in cooperation with the Ministry of Economy and Sustainable Development and the Ministry of Tourism and Sports. Its main goal was to implement working methods in hotel kitchens that would reduce biowaste, i.e. food waste. It was launched in two hotels in Croatia in Pula and Osijek, and the hotel Terme Sveti Martin na Muri later joined the project. The results of the methods implemented in the hotels indicated significant savings (Fond za zaštitu okoliša i energetske učinkovitost, 2022). Little Green Bay boutique hotel on the northern part of the island of Hvar has completely abolished the buffet and plans the entire menu so that all ingredients are used to the maximum. A zero-waste morning smoothie can make a difference and influence the perception of both guests and employees (Lider Media, 2023). In 2023, the Voluntary Agreement on the Prevention and Reduction of Food Waste *Together Against Food Waste* was signed between the Ministry of Agriculture and representatives of food producers and processors, trade, catering, the scientific and academic community, local and regional self-government units, non-profit organizations and initiatives, and associations and companies.

By signing, the signatories voluntarily commit to making efforts to reduce food waste in their business processes. In this way, the Agreement encompasses the entire chain of activities, from food production and processing to households (Ministry of Agriculture, n.d.). Since the literature gives the examples of hotels in Croatia that apply new measures to reduce food waste, it is important to investigate how hotels in Croatia on average manage food waste. The following questions will be researched:

RQ1: *What is the quantity and what are the causes of food waste in hotels in Croatia?*

RQ2: *How do hotels in Croatia manage their food waste?*

2.3. Mobile applications for reducing food waste

Encouraged by the devastating data on the amount of food waste generated every year, many around the world have found a solution in mobile applications whose main goal is the reduction of food waste. Some of these applications are presented below.

Olio – Share More, Waste Less is a mobile application developed in Great Britain with the aim of reducing waste and helping the environment. The application allows users to share excess food with others, thereby reducing the amount of wasted food. Users download the app, register and upload photos and descriptions of the food they want to share. Food exchange is arranged through private messages. The application was launched in 2016 and has around 322 thousand users, mostly in the UK. The app works with cafes, restaurants and food chains, and volunteers collect and distribute surplus food within the community. In addition to food, clothes, books and toys can be shared in the application (Olio, 2015; Radošević, 2017).

Karma - Save food with a tap is an application that connects business entities with people who can then buy leftover food that day at prices that are up to 50% cheaper. Users can view the available offers, buy food through the app and pick it up at the selected facility. The application cooperates with over 9,000 restaurants, cafes, shops and bakeries that report excess food through the application. It was founded in 2019 and is available in Great Britain and Sweden (Karmalicious AB, 2019).

The app *To Good To Go: End Food Waste* bases its business on the concept of *Magic Bags*. End users buy a bag of food at a better price without knowing what is in the bag. The content depends on what is left over in the restaurant, cafe or shop. It was founded in 2016 (To Good to Go Aps, 2016).

Foody Bag – Save On Food is an app that features a selection of random food items that users can purchase at one-third of their retail price. It was founded in 2021 (Apps People Pty Ltd, 2021).

The Your Food - No Waste Inventory app founded in 2021 helps manage the pantry and home inventory by creating shopping lists, managing expenses, sending reminders when food is nearing expiration dates, and sharing and syncing the inventory (Harderue, 2021).

With the *Mystery Pot: End Food Waste* app stores, bakeries, restaurants and cafes report surplus food through the app, and users can view available offers, buy food through the app and pick it up at the selected facility at a specific time. It was founded in 2023 and is available for use in Greece (Mystery Pot, 2023).

In the *Food To Save: salve alimentos* app, people can redeem their surprise bags consisting of products for immediate consumption, expired products or food that is outside the "aesthetic standard" at up to 70% discount. It was founded in 2023, and it can be used in Brazil (Food To Save, 2023).

ResQ Club application – Save food! offers food that would otherwise go to waste from quality restaurants, cafes and bakeries and people can buy it at a more favorable price. It was founded in 2016 and is available in Finland, Germany, Sweden and Poland (ResQ Club, 2016).

The *nosh - Reduce food waste* app nosh helps managing the food inventory and track expiration dates, suggests recipes, creates smart shopping lists, sends media content and news about smart food. It was founded in 2020 and is powered by artificial intelligence (AI) (Nosh Technologies, 2020).

Since there are many apps aimed at food waste reduction, the third research question was the following:

RQ3: *Are the hotels in Croatia familiar with the mobile apps for food waste reduction?*

3. METHODOLOGY

To answer the research questions an online questionnaire was designed encompassing the questions on the quantity and causes of food waste in hotels, management of the food waste including the measures for food waste reduction and possible food donation, and the familiarity of hotels with mobile apps for food waste reduction. The questionnaire was send by e-mail to the five largest/most recognizable hotels from each county and Grad Zagreb making it a total of 105 potential respondents. The hotels were also contacted by phone. The data was collected from May to July 2025. Only 9 hotels completed the questionnaire.

4. RESULTS

Of the 9 hotels included in the study, 8 have excess food in their operations. 2 hotels waste approximately 10 kilograms of food per week, 4 hotels waste approximately 20 kilograms of food per week. 2 hotels waste approximately 50 kilograms of food per week, 1 hotel wastes approximately 280 kilograms of food per week, while 1 hotel during the season wastes approximately 1500 kilograms of food per week. 8 of the 9 hotels included in the study have a person who takes care of food recycling and food waste.

The causes of food waste in hotel operations are shown in Figure 1. As the most common cause of excess food in operations, hotels cite the food left on guests' plates. The next most common causes of excess food in operations are too much of prepared food, leftovers from food preparation, improper food storage and food/groceries spoilage.

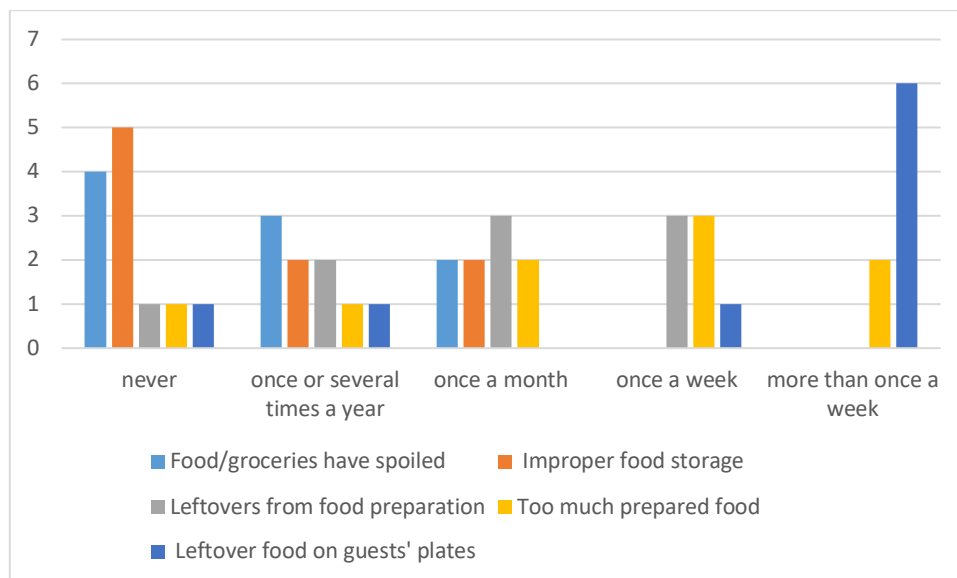


Figure 1: Causes of food waste in hotel operations
(Source: Authors)

The monthly costs for food waste disposal depend on the amount of food waste, the method of waste disposal and the location of the hotels. Thus, the monthly costs of one hotel are around 500 euros per month for biowaste, the second hotel has monthly costs for food waste disposal of 2000 euros, the third hotel has monthly costs for food waste disposal between 400 and 500 euros. The monthly costs of the fourth hotel for food waste disposal are 5700 euros, the monthly costs of the fifth hotel are 300 euros, while the remaining four hotels do not know the amount of the monthly cost of food waste disposal.

2 hotels purchase groceries 2 to 3 times a week, while the other 7 hotels purchase groceries daily. All 9 hotels plan the purchase of groceries and food preparation depending on the number and type of guests visiting them. Of the 9 hotels that were included in the research, 6 always purchase food from local family farms, while the other 3 sometimes purchase food from local family farms.

As many as 7 out of 9 hotels believe that the state does not sufficiently encourage catering establishments to reduce food waste and does not provide them with support to achieve reduction. 1 hotel believes that the state sufficiently encourages catering establishments to reduce food waste and provides them with support to achieve reduction, while 1 hotel remained neutral in answering this question. Not even 1 out of 9 hotels regularly donates surplus food generated in their operations. 4 hotels donate sometimes, and 5 hotels never donate surplus food generated in their operations. The ways in which hotels donate food are: physically, to a nursing home, to various associations, and by invitation. Only 4 out of 9 hotels are familiar with tax breaks for donating food. As many as 6 of them believe that the process of donating food in Croatia is complicated. When asked what would encourage them to donate more, the hotels stated that it would be a change in the legislative framework and reliable partners in the food donation chain.

6 out of 9 hotels see the Best Donor award as an incentive to donate. 7 hotels believe that the food bank will increase and facilitate food donations. 7 out of 9 hotels believe that the introduction of large, small and children's portion options could contribute to reducing food waste. Only 2 hotels believe that the buffet system should be abolished in order to reduce the amount of food waste. 8 hotels believe that the introduction of employee education could influence the reduction of food waste. All 9 hotels believe that food waste can be reduced in their business through transparent communication and raising guest awareness. 4 hotels are familiar with the Griffon machine or a similar device for composting food, but they do not use it in their business. 3 hotels are familiar with and use such a device in their business, while 2 hotels are not familiar with such devices and do not use them in their business. 4 out of 9 hotels are familiar with the VeeMee platform.

When asked if they are familiar with applications, most hotels are familiar with the Olio application (Figure 2). In addition to the Olio app, they are also familiar with the apps To Good To Go, Foody Bag, Food To Save, Your Food. They also stated that they are familiar with this type of app, but those with which they are familiar were not listed.

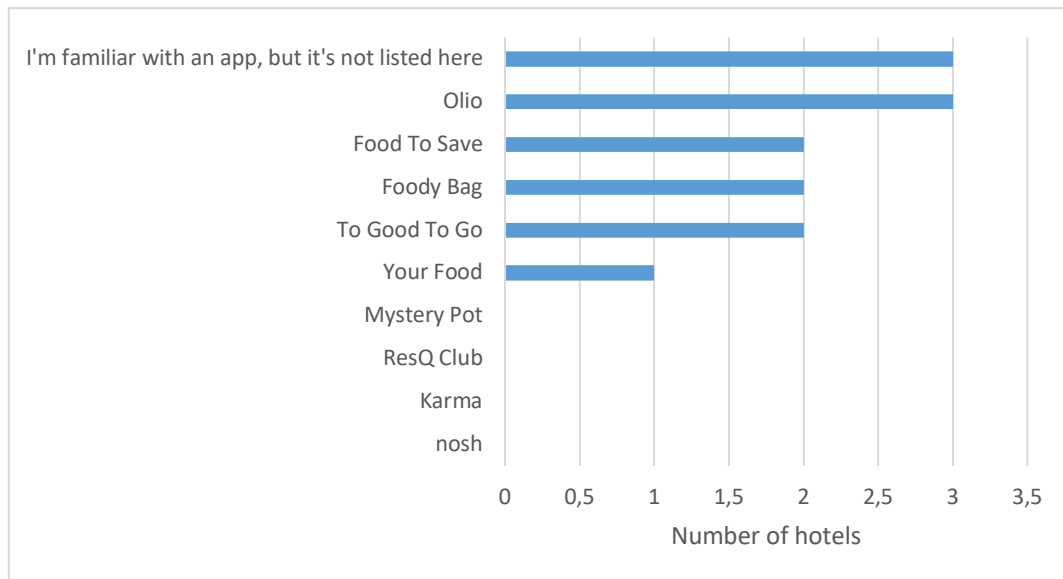


Figure 2: *Hotels' familiarity with the mobile applications for food waste reduction*
(Source: Authors)

8 out of 9 hotels believe that such applications should be implemented in Croatia, in order to contribute to the reduction of food waste. 6 hotels believe that such applications could be applied in their business. The hotels gave several different answers to the question of how they deal with food waste in their business and what plans they have for introducing some new measures to reduce food waste, and these answers are:

- They turn leftover bread into breadcrumbs and soup dumplings
- They make marmalades from rotten fruit
- They fill the buffets with food as the restaurant fills with people
- They have placed messages for the guests to take what and how much they want, but to eat it then, and not throw the food away
- Training of kitchen and service staff
- Planning the types of menus and the amount of prepared food
- Separating biowaste
- Recycling most of the food waste
- They own a Griffon device
- They participate in the Food zero waste project

3. CONCLUSION

Food waste is a major economic, social and environmental problem of modern times. According to available data, 71 kg of food waste is produced per capita in the Republic of Croatia annually, of which 54 kg is generated in households and 17 kg in the business sector. Croatia is keeping pace with the adopted regulations of the European Union and striving to achieve the goal of the 2030 Agenda adopted by the United Nations, but the question arises whether the adopted regulations are sufficiently presented to the business sector and households. The results of the research show that the amounts of food waste produced in the Croatian hotels are significant and there is room for improvement, which the hotels themselves are aware of. The results also show that the disposal of waste generated in their business causes considerable costs. The positive thing is that 8 out of 9 hotels have a person in charge who takes care of food recycling and food waste. 7 out of 9 hotels included in the survey believe that the state does not sufficiently encourage catering establishments to reduce food waste and does not provide them with support to achieve the reduction.

The results also show that there is significant room for improvement in terms of food donation, as 4 hotels only sometimes donate surplus food, and 5 hotels never donate surplus food generated in their operations. Mobile platforms are potential solutions for reducing food waste. 8 out of 9 hotels believe that such applications would be useful, and 6 out of 9 hotels believe that such applications could be applied in their operations and thus reduce waste generation in their operations. The results indicate the readiness of hotel management to innovate their food waste management activities. A limitation of the survey is the relatively small number of hotels that responded to the survey.

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FROM "FOR MORE BEAUTY" TO "THE SPICE OF EUROPE": AN ANALYSIS OF TOURISM SLOGANS FROM THE PAST DECADES FOR HUNGARY AND BUDAPEST

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ABSTRACT

Coinciding with Hungary's accession to the European Union in 2004, a distinctive tourism campaign emerged under the slogan "One of Us". Billboards boldly invited viewers with the phrase: "For more beauty, visit Budapest, a new capital of Europe". These advertisements prominently featured the Hungarian winner of the Miss Europe 2003 contest, creating a clever double entendre that highlighted both Hungary's tourism attractions and its beauty queen. Despite the creative play on words, the campaign faced notable criticism – a recurring theme in Hungary and Budapest's promotional efforts. This article compiles and analyzes the evolving landscape of tourism slogans used by Hungary and its capital over the past decades, tracing their development from the pre-EU accession era to the present. One striking feature that emerges over the years is the repeated reference to Europe – whether positioning Hungary as "in the heart of Europe", "a new capital of Europe", or "the spice of Europe". This highlights a consistent effort to anchor cultural identity within a broader European context, while also emphasizing Hungary's uniqueness.

Keywords: *tourism marketing, country branding, nation branding, destination slogans, country slogans, Hungary, Budapest, Europe*

1. INTRODUCTION, THEORETICAL FRAMEWORK

Simplified to some extent, a brand fundamentally relies on three core visual identity elements: the brand name, the logo, and the slogan. These elements are crucial, each playing a distinct role in shaping the identity and image of the brand (Galí, Camprubí, & Donaire, 2017). Delving into the etymology of the word "slogan" reveals its origins in the Celtic term "slaugh gairm", which originally referred to a call to gather and, in times of war, served as a battle cry (Healey, 2009). Soldiers rallied to this call, and upon hearing it, they knew they were expected to give their lives and blood for victory and a shared purpose. Over time, slaugh gairm evolved into "slughorn", then "sluggorne", ultimately entering the English language in the form "slogan" (Ries, 2015). Although the term is no longer used in its original military context, it is clear that slogans remain powerful tools in brand communication. As noted by Kotler, often referred to as "the pope of marketing", and Keller, one of the most renowned experts in branding, in their book *Marketing Management* (Kotler & Keller, 2006), slogans play a critical role. The authors emphasize that the task of a slogan is to guide consumers in understanding the essence of the brand and what makes it unique (Kotler & Keller, 2006). Kohli, Leuthesser, and Suri (2007) echo this sentiment: slogans can serve as 'hooks' or 'handles' to capture the meaning of the brand and convey what makes it special. Moreover, while logos or brand names are more challenging to modify, slogans are easily adaptable. This flexibility allows them to serve as dynamic components of brand identity, acting as bridges between the brand's heritage and its evolving, modern image (Kohli, Leuthesser, & Suri, 2007). Sárközy (2009) also highlights that slogans encapsulate the brand's verbal message. In her view, a well-crafted slogan conveys the unique selling proposition (USP) of the brand.

She asserts that a slogan is an essential part of brand communication – both its foundation and its pinnacle. However, as Ries (2015) points out, a slogan cannot be effective if it is not memorable. Drawing from her experience as a strategic marketing consultant, she outlines five techniques for creating memorable slogans: rhyme, alliteration, repetition, reversals, and double-entendre. Rosengren and Dahlén (2006) further argue that slogans play a key role in establishing brand prestige. According to them, while logos are less human – primarily visual and graphic in nature, designed to capture attention without prompting deeper thought – slogans, by contrast, engage in a more human-like interaction. This is because they often employ everyday language to communicate the brand's values directly. The literature on slogans has identified several characteristics essential for a slogan to be effective and successful. In his book *The Power of the Brand Name* (2020), Papp-Váry elaborates on the key attributes of a good slogan. Firstly, it "captures" the brand's positioning by conveying a clear message that tells the brand's story. It is equally important for the slogan to be appealing, highlighting consumer benefits while carrying positive connotations. A good slogan inspires and activates, encouraging consumers to purchase the product or seek further information about it. Additionally, it should be relatively short, typically no longer than five words. Distinctiveness is another crucial factor: a slogan must be unique, original, and different from competitors'. Longevity and sustainability are also vital – the organization should not feel compelled to replace it frequently. Furthermore, the slogan should align with the logo, be easy to remember and repeat, and ideally be catchy and clever. Finally, it is essential for the slogan to resonate not only with customers but also with employees, fostering a sense of pride and affinity among those who represent the company. Despite the emphasis often placed on the importance of slogans, in reality, only a handful are memorable. For instance, while nearly everyone recognizes Nike's slogan, "Just do it," its largest competitor, Adidas, has a significantly less known slogan (currently: "Adidas is all in"). This highlights the challenge, even for the largest corporations, of creating the perfect, memorable slogan. However, this does not imply that a good slogan is not valuable. Its impact should neither be overestimated nor underestimated. A well-crafted slogan not only strengthens the brand's image but can also directly contribute to increased sales. Conversely, a poorly conceived slogan can undermine marketing and sales efforts.

2. THE IMPORTANCE OF TOURISM SLOGANS

Tourism slogans play a role as significant as the taglines of traditional products. A well-chosen slogan can enhance the appeal of a destination, while a poorly crafted or cliché-driven slogan may diminish the effectiveness of brand building. According to Pike and Page (2014), a slogan represents the core, public manifestation of brand strategy for most destinations. This means that the slogan must convey the most essential characteristics of the destination as vividly as possible (Supphellen & Nygaardsvick, 2002). Slogans serve three primary functions: they reinforce brand image, facilitate brand recognition, and promote brand differentiation in the minds of consumers (Kohli et al., 2007). Some destinations successfully develop dynamic, evocative, and easily recognizable slogans that strengthen their international positioning. Others, however, are less successful, opting for slogans that fail to produce the same impact (Lehto et al., 2014). There is broad consensus that distinctive slogans with unique messaging contribute to better positioning by enhancing a destination's uniqueness and recognition (Donaire & Galí, 2012). In contrast, slogans that attempt to "sell everything at once" often come across as too generic and lack originality, offering little specificity about the destination. Studies by Klenosky and Gitelson (1997) and Obiol (2002) highlight that many tourism slogans are not sufficiently thought through and fail to reflect a well-developed, coherent marketing strategy.

An effective slogan is simple, concise, clear, and direct, conveying the intended message accurately. If a slogan requires additional promotional materials to become comprehensible, this indicates that the slogan alone is less effective (Pike, 2004). The difficulty in creating tourism (destination) marketing slogans stems from the fact that crafting slogans for destinations is a far more complex process than for products or services. When developing destination slogans, professionals must consider numerous factors that influence the tourism experience, including social, cultural, economic, and political conditions (Supphellen & Nygaardsvik, 2002). It is therefore unsurprising that producing effective slogans capable of successfully promoting tourism destinations presents a significant challenge (Klenosky & Gitelson, 1997; Lehto et al., 2014). Furthermore, in the case of international campaigns, there is less flexibility in developing slogans compared to logos, as slogans are tied to linguistic codes. Although English is the primary language for tourism slogans, it is crucial that they remain comprehensible and relevant in other languages as well. This adds to the challenge of crafting tourism slogans that are effective, memorable, unique, and simultaneously resonate with all potential audiences. As a result, slogans often lean toward safer, less distinctive solutions that ultimately prove less effective in attracting tourists. Although relatively little empirical research has been conducted in this area, an analysis of 120 tourism destination slogans identified several common characteristics (Galí, Camprubí, & Donaire, 2017). These shared features indicate that tourism slogans are typically short, meaningful, supply-side oriented, and frequently include specific geographic references. This suggests that tourism strategies focus on two fundamental criteria. The first criterion is simplicity – slogans use a minimal number of words and concepts. The second is exclusivity – the appeal of slogans lies in the emotional (affective) component of the message, signaling a shift from descriptive (cognitive) strategies to those targeting emotions (Galí, Camprubí, & Donaire, 2017).

3. METHODOLOGY – AIM OF THE STUDY AND BASIS OF THE ANALYSIS

Building on the literature review and its findings, the goal of this study is to compile and analyze the slogans used to promote Hungary and Budapest over the past 20-30 years, identifying the key elements they emphasize. To achieve this, we collected the most significant slogans and validated them with tourism professionals to ensure that our compilation was comprehensive and no key slogans were overlooked. In gathering the slogans, we also aimed to understand the context and background behind their creation. One of the most intriguing aspects of the analysis was to identify which words or phrases appeared most frequently in the slogans. It is important to emphasize that while additional slogans were indeed used for Hungary and Budapest, they were either short-lived or appeared only in specific materials. As such, their inclusion was deemed less relevant to the scope of this study. Due to space constraints, our analysis focuses exclusively on the most prominent slogans.

4. SLOGANS OF HUNGARY AND BUDAPEST OVER THE PAST DECADES

"Hungary – In the Heart of Europe"

(Late 1990s – Early 2000s)

The slogan used in the late 1990s and early 2000s seemed like a logical choice, as Hungary needed to convey to the world – especially in the lead-up to joining the European Union in 2004 – that it was an important part of Europe. This slogan aimed to "put the country back on the map", effectively serving Hungary's promotional needs at the time. However, one major drawback was that many other countries used a similar slogan. Several former socialist countries adopted variations of it, making it less distinctive. This posed a challenge even though, among these nations, Hungary could arguably claim to be the true heart of Europe, whether in terms of geography or historical significance.

The "slogan competition" intensified as numerous Western European countries and capitals occasionally employed the phrase "In the heart of Europe". A variation of this slogan highlighted Hungary's millennium-old statehood, a fitting choice for the 2000 celebrations: "1000 years in the heart of Europe". Interestingly – though unsurprisingly – this slogan continues to resurface periodically, appearing in key slides of presentations about Hungary (e.g., Stipendium Hungaricum scholarship materials or the Hungarian Chamber of Commerce and Industry's presentations) and even as the title of books (Korniss, 1998). It is likely no coincidence that during this period, Hungary's tourism logo was a heart rendered in red, white, and green – colors of the national flag – aligning with the slogan's thematic elements.

"Hungary – The Meeting Point"

(2000)

The slogan "Hungary – The Meeting Point" was developed for an image film created for Hungary's pavilion at the 2000 Hannover World Expo. While the film itself received praise, the slogan – crafted by the National Image Center at the time – faced criticism. The concept behind the slogan was that Hungary serves as a place where cultures and traditions intersect, where the past meets the future, and East converges with West. Supporting materials elaborated on these ideas with detailed justifications and examples. Much like the "Hungary – In the Heart of Europe" campaign, this slogan also appeared as the title of a book published in the same year (Moldován, 2000).

"Welcome to Hungary – Europe's New Country of Beauty" and "One of Us – For More Beauty, Visit Budapest, a New Capital of Europe"

(2003, 2004)

Hungary launched a unique, playful nation branding campaign in 2003 and 2004, drawing inspiration from two key events: the victory of Hungarian Zsuzsa Laky as Miss Europe in 2003 and Hungary's accession to the European Union in 2004. The slogans reflected this dual focus, with references to Hungary as a "new country" and Budapest as a "new capital" in Europe. The first slogan read: "Welcome to Hungary – Europe's New Country of Beauty." The second slogan – more of a headline – was: "One of Us." It continued with: "For more beauty, visit Budapest, a new capital of Europe."

The timing of the latter campaign was deliberate, coinciding almost exactly with Hungary's EU accession in 2004. The former emphasized the beauty of Hungarian women – a striking, if somewhat unconventional, angle for attracting tourists. While the campaign's premise might have been true to some extent, it raised questions about its effectiveness. After all, in many families, travel decisions are made by women, and few may be inclined to take their husbands or partners to a country known for its exceptionally beautiful women. A distinctive element of the campaign was the image of the beauty queen featured on the fuselage of an airplane. As one critical blogger humorously remarked, "Hungary, the country of women lying in lingerie – that's what came to my mind" (Logout.hu, 2009).

"Hungary – The Land of Spas"

(2004)

Following the dissolution of the National Image Center during the 2002 government transition, national image campaigns were taken over by Tourism Rt. This shift represented more than just administrative restructuring – it marked a philosophical change. While the National Image Center had focused on broader nation branding tasks, Tourism Rt. narrowed its focus exclusively to tourism promotion and destination branding.

One outcome of this shift was the "The Land of Spas" campaign around 2004. A 30-second film accompanied the slogan, showcasing Hungary's renowned thermal baths and water parks. The film featured people of various nationalities speaking in multiple languages (German, English, Japanese), each extolling Hungary's exceptional spas. The ad concluded with the line: "Hungary keeps the world healthy."

"Hungary – Some Like it Hot" and "Budapest – A City to Visit, A City to Live"
(2004)

Running parallel to the "The Land of Spas – Hungary keeps the world healthy" campaign was a playful promotional film aimed at retired Floridians. The film's star was Hungarian-born Tony Curtis, who referenced his most famous movie, "Some Like it Hot." In the ad, Curtis sits in a café sipping hot coffee, while casting an appreciative glance at the backside of an attractive waitress. (Even in 2004, this scene felt somewhat questionable, and even more so by today's standards.) Meanwhile, the visual montage showcased Budapest's landmarks – and only Budapest's – accompanied by the text: "Budapest – A city to visit, a city to live."

"Talent For Entertaining"
(2005-2008)

The "Talent for Entertaining" slogan sits at the intersection of tourism promotion and broader nation branding. It conveyed values Hungary sought to highlight post-EU accession – namely, that Hungary is a country of talented people. However, as the campaign was spearheaded by Tourism Zrt., it can be firmly classified as a tourism initiative. The campaign's distinctiveness lay in its use of prominent figures – although "prominent" is somewhat subjective. The most recognizable was probably chess grandmaster Judit Polgár, but many of the featured personalities were not widely known, even among Hungarians.

"Minimundus"
(2008)

As Hír24 described in 2008: "Hungarian Tourism Zrt. replaced its long-used, somber-colored international tourism brand with a more vibrant slogan, bold colors, and Matyó folk motifs." The brand pillars highlighted Budapest as a global city and emphasized personal experiences, the lack of mass tourism, and relatively untouched landscapes. The campaign also underscored the diversity of offerings, which inspired the project's working name. The essence of the Minimundus concept was that visitors to Hungary could experience vastly different "worlds" within arm's reach. A tourist could soak in a thermal bath to unwind after the Formula 1 Grand Prix, the Sziget Festival, or a hike in Hortobágy. Hungary was portrayed as a small island in Europe – one without a coastline or towering mountains but rich in historical heritage and natural assets, making it an exciting travel destination. Artificial Group created the visual identity for the campaign, under the tagline "Small country, big experiences." The corresponding promotional film and posters were notable for featuring giant people at iconic tourist sites – hence the name "Minimundus".

"A Love for Life"
(2008-2009)

Running parallel to the Minimundus campaign, "A Love for Life" represented a different creative interpretation of the same concept, featuring a similar visual approach. Interestingly, while the United States and the United Kingdom adopted this slogan, German-speaking regions encountered alternative concepts during the same period. For instance, in Switzerland, Hungary was promoted with the phrase "Keine Berge, doch Spitze" ("No mountains, but still peaks") (Hír24, 2008).

However, the "A Love for Life" slogan was replaced relatively quickly. One possible reason for this was Slovenia's adoption of the "I feel love, I feel Slovenia" slogan in 2007. This Slovenian campaign was particularly strong, as it cleverly incorporated the country's name with the word love. It's no coincidence that Slovenia continues to use this slogan in its campaigns to this day.

"Hungary – World of Potentials"
(2011)

The film associated with this slogan was a kind of follow-up to Budapest's investment promotion video, "Budapest, Get Engaged". Released at the end of 2010, the nearly 7.5-minute film not only showcased Hungary's tourist attractions but also highlighted the numerous inventions Hungarian innovators contributed to the world – including the telephone exchange, refrigerator, soft contact lenses, vinyl records, the Kodály Method, Excel, and Prezi. The narrative frame of the film follows a young couple who arrive in Hungary by plane. After exploring the country and experiencing everything it has to offer, they decide not to board their return flight, choosing instead to stay in Hungary. Due to its length and content, the film likely resonated most with Hungarians, despite the slogan being in English: "World of Potentials". However, there was also a targeted foreign audience – the film was screened during Hungary's EU Presidency in the first half of 2011, shown to visiting delegations at various events. This focus on Hungary's potential made the slogan a logical choice. The film was commissioned by the Ministry of Foreign Affairs and Trade, rather than Tourism Zrt., underscoring its broader, investment-oriented message rather than purely tourism-focused branding.

"Budapest – Be a Winter 'Invader'!"
(2008)

Although this campaign focused on Budapest, it is worth highlighting due to its wit and the fact that it was jointly financed by Tourism Zrt. and the MALÉV airline.

As the advertisement text playfully states:

"After 400 years of the Romans, 150 years of the Ottomans, and 45 years of the Soviets, you'll be the first who is welcome to stay longer.

So have an extra night on us!"

It continues:

"There are so many unforgettable things to experience here.

Make time to see them all.

Book three nights and get a fourth free."

This advertisement makes a clever nod to Hungary's historical past. However, there is some doubt as to whether foreign audiences could fully decode the humor of the message. For an advertisement to be effective, it must build upon existing memory structures. Few visitors are likely to be familiar enough with Hungarian history to know about the 150-year Ottoman occupation or the 40-year presence of Soviet troops.

"Think Hungary – More than Expected"
(2013-2018)

The "Think Hungary – More than Expected" slogan was introduced in 2013. The accompanying, award-winning promotional film showcased Hungary's culture, architectural marvels, beautiful landscapes, thermal waters, and culinary specialties. As the video progressed, it shifted focus to Hungarian ingenuity and creativity aimed at investors.

A notable strength of the slogan is that it moves beyond clichés like "Discover" or "Beautiful." However, the phrase "more than" is one of the most overused expressions in marketing communication.

A further drawback of the slogan "more than expected" is that it subtly underpositions Hungary by implying that travelers planning to visit do not have high expectations – effectively suggesting that people assume little about the country's offerings. Interestingly, in late 2016, The Telegraph published an article titled "Mapped: The World's Best (and Worst) Tourism Slogans," in which it ranked Hungary's slogan as one of the worst in the world (The Telegraph, 2016).

"Budapest – Spice of Europe" (2018–)

Just as Budapest-focused and spa-focused campaigns ran concurrently in 2004, Hungary's international communication in 2018 also began with a Budapest-centric campaign, launched by the Hungarian Tourism Agency. A new Budapest logo was created for the campaign, with "BUD" highlighted, referencing the city's airport code commonly seen at airports. The wave element in the design symbolized the Danube River. In addition to the logo, extensive content was produced, including a new website and image film, developed with the involvement of the Graphasel agency. According to the agency, the "Spice of Europe" slogan aimed to convey the "metaphorical spiciness and diversity" of the capital (WeLoveBudapest, 2018). As the agency described the concept: "Budapest is the spice of Europe because visitors here can find all the classic cosmopolitan values characteristic of European capitals – historical heritage, eclectic and elegant architecture, vibrant cultural offerings, world-class gastronomy, and a flourishing fashion and design scene. Yet, alongside all this, the city's liberated atmosphere continually stimulates travelers' senses." (WeLoveBudapest, 2018). The initial campaign film featured a young couple guiding viewers through the city, visiting landmarks such as the Palace of Arts, the Millennium Underground, the Vasarely Museum, the Széchenyi and Gellért Baths, the Castle Garden Bazaar, and the Parliament. In the narrative, the young man had visited Budapest as a child and wanted to show the city to his partner. A worn photograph of the boy in front of a large pot of goulash is shown on the plane, and by the end of the film, they are eating goulash – which the woman finds "spicy" in line with the campaign theme.

"WOW Hungary" (2018–)

Hungary's latest tourism slogan, "WOW Hungary," was unveiled at the 2018 Tourism Summit and continues to be used today. As highlighted by the Hungarian Tourism Agency: "The slogan 'WOW Hungary' is attention-grabbing yet simple. The word 'WOW' is universally recognized and evokes a sense of surprise and wonder. Additionally, within the context of Hungary's nation brand, WOW serves as an acronym for 'Wellspring Of Wonders', reflecting the country as a source of marvels. The logo accompanying the new visual identity draws inspiration from the symbolism of the triple hill, incorporating the motif of a road – symbolizing Hungary's accessibility and the spirit of discovery and travel." (MTÜ, 2018).

5. CONCLUSION: MANY CAMPAIGNS, MANY SLOGANS – BUT EUROPE AT THE CENTER

A tourism slogan is effective when it captures the essence of a place, differentiates it from competitors (i.e., other destinations), encourages tourists to learn more about the location, and ultimately inspires them to visit.

The unique challenge of a slogan is to achieve all of this in the shortest possible form – typically no more than five words to convey the distinctiveness of the destination. As demonstrated by the cases presented earlier, numerous efforts and campaigns have aimed to promote Hungary over the past decades, each almost always accompanied by a new slogan. When reviewing the list of slogans, recurring themes clearly emerge. Some concepts – such as focusing on Budapest or highlighting water – reappear regularly. However, perhaps the most significant recurring element in these slogans is the consistent reference to Hungary and Budapest's connection to the European continent, often described as its heart or, more recently, its spice. This idea first emerged in the late 1990s and early 2000s with slogans like "Hungary – In the Heart of Europe" and, during the millennium celebrations, "1000 Years in the Heart of Europe." Similarly, Hungary's EU accession campaign drew attention to Europe with slogans such as "Welcome to Hungary – Europe's New Country of Beauty" and "One of Us – For More Beauty, Visit Budapest, a New Capital of Europe." Finally, the current tourism slogan for Budapest – "The Spice of Europe" – once again emphasizes the city's unique role on the continent. It is worth revisiting the research of Galí, Camprubí, and Donaire (2017), who analyzed slogans from 120 tourism destinations. They concluded that successful slogans tend to be short, meaningful, focused on offerings, and often include explicit geographical references. As we have seen, in the case of Hungary and Budapest, the geographic reference consistently highlights the connection to Europe, while emotional appeal is introduced through terms like "spice" and "WOW."

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THE RULE OF LAW IN DEVELOPMENT CONDITIONS OF THE BIPOLAR AND MULTIPOLAR WORLD ORDER

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ABSTRACT

The subject of the work considers the rule of law in the conditions of bipolar and multipolar development of the world order. In the article, from an epistemological, first of all, politico-legal point of view, categorical concepts are defined in direct connection with the subject of research (modern state, rule of law and legal state) and problems in realizing the "rule of law" in the complex conditions of the modern development of international relations are identified. The initial hypothetical assumption in the paper is that the concept of "rule of law" is difficult to achieve at the current level of development of modern states due to conflicting interests between globalists and sovereignists. Therefore, in this paper, instead of the concept of "rule of law", a more suitable model is proposed: "management of modern and sovereign societies by the people with the help of the state and law". The main feature of this model is reflected in the fact that citizens, individually and all together, are creators of the state and rights. Starting from that key premise, the modern state has a civilizing and constitutional mission to protect citizens by all democratic means and enable them to enjoy political, economic, social, cultural, technological and security prosperity. From an epistemological point of view, such a model can be realized if the subjects of international relations at the global, regional and national levels truly and without exception stand for the development of modern states that dream of realizing the principles of justice, freedom, equality and democracy, as well as the consistent realization of the principles: parliamentarism, political pluralism, the legitimacy of power confirmed in elections and the division of power into legislative, executive and judicial, based on the balance and control of power, democracy, and respect for human rights and guaranteed freedoms credible international conventions adopted in the Organization of the United Nations.
Keywords: modern state, rule of law, legal state, justice, freedom, equality, democracy, human rights and freedoms

1. INTRODUCTION

Modern political-legal theory has confirmed the premise that the prototype of the modern state is, in fact, a legal state based on the rule of law. Without delving into a broader epistemological discussion about the state, it is necessary in the introduction of this paper to point out the most significant changes in the understanding of the traditional state, in order to more scientifically define categorical concepts such as the "modern state" based on the rule of law. Starting from this initial premise and considering the current state of international relations, the fundamental research question arises: is it even possible under today's circumstances to achieve the concept of a modern democratic legal state founded on the rule of law?

From this broadly formulated question arises a narrower research subject, which refers to the rule of law in the context of bipolar and multipolar development of the world order. Operationalization of the research subject leads to a general hypothesis which reads: at the current stage of development of modern states, the concept of the “rule of law” is difficult to achieve due to the conflict of interests between globalists and sovereigntists, the actions of power centers within international organizations with opposing interests, and the existence of modern nation-states at varying levels of development (Danilović N, Danilović A, 2018: 2). Since the subject of this research is the rule of law in the context of the development of a bipolar and multipolar world order, the paper first attempts to define categorical terms directly related to the topic, such as: bipolar order, multipolar order, modern state, modern law, state law, international law, "legal state" and "rule of law." Subsequently, the paper seeks to uncover trends and identify differences in the implementation of the “rule of law” model between the bipolar and multipolar concepts of global order development (Danilović N, Danilović A, 2018: 2).

2. MEANING OF TERMS

2.1. The Meaning of the Terms Bipolar and Multipolar Order

2.1.1. The Concept of Bipolar Order

During the Cold War period (1946-1991), a structure of international order was established in which two superpowers (the USA and the USSR), with a defining balance of power, dominated political, military, and economic relations globally through continuous competition, the triggering of conflicts, and attempts to stabilize international relations within divided spheres of influence. This global order was characterized by a high concentration of power, low system flexibility, and relative predictability of actors' behavior (Waltz, 1979; Mearsheimer, 2001). According to Kenneth Waltz (1979), “A bipolar system is one in which two great powers dominate international politics, reducing uncertainty and facilitating a balance of power due to the smaller number of actors and clearer perceptions of strength.” John Mearsheimer (2001) argues that “a bipolar world is less unstable than a multipolar one because it reduces the chances for miscalculations and conflicts among smaller states, since two powers dictate the rules of the game.” Engaging with realpolitik, Henry Kissinger maintains that a bipolar order involves a distribution of power between two states strong enough to impose norms, regulate conflicts, and maintain balance, often through repressive or controlled spheres of influence (Kissinger, 2006). Raymond Aron, a representative of realist pluralism, views bipolarity as a situation in which two superpowers dictate the dynamics of global politics through rivalry, without direct military confrontation but with constant competition in all other aspects of power (Aron, 2001). Barry Buzan and other Copenhagen School scholars argue that a bipolar order can generate stability if there is a high degree of predictability between the poles and clearly defined spheres of influence (Buzan, 1983). Neorealist Robert Gilpin believes that bipolar structures provide relative stability to the international system by reducing the number of potential challengers to the hegemon (Gilpin, 1981). From the positions of these and other authors, we have identified common elements of the concept of the bipolar order and, through inductive-deductive reasoning, formulated the following synthetic working definition: Bipolar order in contemporary international relations refers to the structure of the global system during the Cold War, in which two superpowers dominate political, military, and economic affairs, determining the balance of power and conflict dynamics through arms races and technological competition, while maintaining stability within clearly divided spheres of influence.

2.1.2. The Concept of Multipolar Order

In contrast to bipolarity, multipolar order has attracted growing interest from authors since the early 1980s. Neorealist Kenneth Waltz, in his *Theory of International Politics* (1979), emphasizes that a multipolar system is characterized by a larger number of great powers balancing each other's strength, resulting in greater complexity and higher potential for miscalculations and conflict. Hans Morgenthau (2006), a proponent of classical realism, argues in *Politics Among Nations* that multipolarity provides greater flexibility to the international system by allowing maneuvering among powers and preventing the dominance of one or two states. John Mearsheimer (2019) asserts that the multipolar system is more dangerous because a greater number of powers increases the probability of war, with alliance instability and unpredictable actor behavior. Henry Kissinger suggests that in a multipolar world, balance of power is maintained through complex diplomacy and shifting alliances, requiring high diplomatic skill and constant adjustment (Kissinger, 2006). Hedley Bull, of the English School, believes multipolarity promotes the development of an international society in which states cooperate and regulate their mutual relations through norms, institutions, and balance (Bull, 1977). Neoliberal institutionalist Robert Keohane maintains that multipolarity creates space for a greater role of international institutions, as no single state can impose the rules of the game (Keohane, 1988). From these perspectives and others, we can inductively conclude that the term multipolar order essentially denotes the structure of the international system that emerged after the Cold War, in which multiple great powers share and shape global influence. International relations under this system depend heavily on the quality of a complex network of relations, shifting alliances, and frequently unstable balances among key actors. Multipolarity allows for greater flexibility but also higher unpredictability and risk of conflict due to the multitude of actors with differing interests a fact clearly confirmed in the period following the collapse of the bipolar order (1991 to present). This synthetic working definition is primarily shaped by shared elements identified in the cited definitions.

2.2. The Meaning of the Concepts of Traditional State and Modern State

In the process of reaching an objective scientific understanding of the “rule of law” within the framework of bipolar and multipolar developments of the world order, it is first necessary to determine the meaning of the fundamental categorical concept of the “modern state,” as it is precisely within modern states that the model of the “legal state” and its concept of the “rule of law” are realized. Without a precise determination of the meaning of this categorical concept, it is not possible to comprehend the realization of the concept of the “rule of law.” Before we begin to define the term “modern state,” it is necessary to understand how contemporary legal theory and social practice perceive the concept of the “traditional state.”

2.2.1. The Meaning of the Concept of the Traditional State

Although there is no consensus among scholars on a single definition of the state, according to most political science and legal sources, the traditional state is defined as an organization with a monopoly on physical force and a unifying and consolidating role in society, which it achieves through a multitude of functions (Lukić, 1964; Dubreuil, 2010; Gordon, 2002, 4; Hay, 2001, 1469-1475; Donovan, 1993, 20; Shaw, 2003, 59; Cudworth, 2007, 1). One of the most frequently cited definitions is that of Max Weber, who essentially described the state as a mandatory political organization with a centralized government that maintains a monopoly on the legitimate use of force within a territory of a given social community (Cudworth, 2007, 1; Salmon & Imber, 2008, 54). From the theory of state and law, it is well known that the emergence of the state and law is a foundational element in the development of human society, particularly in regulating relationships among people within states, between different states, and between the state and the natural environment (Danilović & Nogo, 100).

Furthermore, the state and law played a significant role in the development of socio-economic formations, within which, thanks to the state and law, human behavior became more rational, organized, predictable, and mutually conditioned. Through such interactions, various cultures and civilizations emerged, and traditional states and their laws were modernized. Different relations among states contributed to the emergence of international legal norms across all areas of law (Danilović, N. & Danilović, A., 2018, 4).

2.2.2. The Meaning of the Concept of the Modern State

With the development of international relations and the codification of international law norms, as well as the proclamation of peaceful dispute resolution between states and the incorporation of the concept of human rights and freedoms into state politics and law, the role and functions of the traditional state were significantly altered. Two criteria influenced this change: primarily, the temporal existence of the state, and second, the achievements of modern state organization. The changes arising from the lawful functioning of the state over time and the achievements expressed in the recent period of the development of modern states provide a good basis for defining the concept of the “modern state.” Below are the fundamental characteristics of modern states at the current stage of human civilization:

- a) The achieved level of democracy, human rights, and freedoms accessible to all strata and citizens of modern society;
- b) The establishment of a “welfare society” in which all members have equal opportunities to freely express their abilities;
- c) The advancement of science, culture, and education, enabling all members of society to have a wide and unrestricted scope for creation and use of cultural products, without impoverished or disenfranchised individuals or groups (Danilović, N. & Danilović, A., 2018: 4-5).

The main prerequisite for achieving these values of the modern state is a stable democratic state, not threatened by contradictions within its own society or by other countries in its vicinity. Such a state can be said to possess all the attributes of a modern legal state and can be defined as:

“A state with a developed, stable legal system that ensures the sovereignty of power over its territory and the rule of the people through modern, democratic methods of governance, in which the citizen is not a subject of state authority but a fully entitled member of the ruling societal structure” (Danilović, N. & Danilović, A., 2018: 5).

The epistemological foundation of this definition consists of three components: a developed, stable legal system; the sovereignty of power over the state’s territory; and the rule of the people through democratic governance. This definition holds epistemological value because it contains the fundamental meaning of the concept of a modern state. It is categorical in two ways: it discusses the categorical concept of the modern state and the object it designates. In form, it is a statement of the key attributes of a modern state. It is nominal and meets all eight criteria for defining theoretical concepts: it is positively stated; it is both objective and substantive; it encompasses the full scope of the concept; it is essential and includes fundamental attributes by which the concept of a modern state can be identified; it is complex and developmental, like the concept it defines; it is equivalent and proportional; it is precise and contains only essential and necessary elements; and it is dialectical, just like the social reality it represents (Danilović, N. & Danilović, A., 2018: 5).

Through structural and functional analysis of the current development level of international relations, it can be said:

“Such a modern state does not exist today, but there are several developed states that have reached a high level of democracy; that respect their citizens’ human rights; that are highly developed and aspire to establish a welfare society; and that have attained satisfactory levels of scientific, cultural, and educational development where their citizens enjoy the freedom to create and use cultural products.”

In these and other aspiring states, influenced by continuous growth in human knowledge, technological advancements, production increases, and improved living standards, the characteristics of modern states and their governments are changing in three key directions:

- 1) The state is becoming less independent and sovereign, and increasingly dependent on other states and international organizations;
- 2) There is a growing expansion of the state’s regulatory competencies;
- 3) There is an increasing role of citizen oversight in modern states (Danilović, N. & Danilović, A., 2018: 6).

Unfortunately, these and other observable trends in the development of modern states unmistakably lead to: “The limitation of sovereignty and uniqueness of national states and the reduction of citizens’ privacy, which contradicts the democratic principle of governance by the people, through the state and law” (Danilović, N. & Danilović, A., 2018: 6).

Moreover, current developments in international relations indicate that the basic functions of the modern state have been significantly altered. For example:

“The primary function of internal security is increasingly transforming into international security. The function of creating and maintaining internal legal order is becoming subordinate to the primacy of international law. Traditional state sovereignty, due to the growing influence of international organizations, is shifting into limited sovereignty” (Danilović, N. & Danilović, A., 2018: 6).

These and other facts, confirmed in both theory and practice, regarding the changed character of the modern state, require answers to two crucial questions: First, is it more beneficial for human society to maintain individual states, nations, races, religions, customs, and other distinctions, or is a single global world state, with one culture, universal technology, and global behavioral norms, both possible and desirable in the future? Second, where is the development of modern states leading? Toward a clash of civilizations or a merger of human society into a globalized, unified human community? Does the unification of national states into international organizations under the strong influence of major global powers lead to this goal or not?

The answers to these questions are of essential importance for the further development of modern states and human civilization as a whole. This previous, albeit brief, epistemological discussion on the meanings of the concepts of “traditional state” and “modern state” allows us to continue the discourse on the relationships between concepts such as: law, modern law, state law, and international law.

2.3. The Relationship Between the Concepts of Law, Modern Law, State Law, and International Law

2.3.1. The Meaning of the Concept of Law

Throughout the history of human civilization, relations within and between sovereign states have been based on law. The state, as an institution, cannot function or survive without law, which is a necessary instrument for managing any organized process or relationship within an organization.

In the theory of state and law, it has been scientifically verified that the state creates (prescribes, imposes by force) the law and enforces it through coercion. The existence of authority and governance is impossible without a legal system that prescribes obligations, powers, penalties, and rewards for the non-fulfillment or fulfillment of international treaties, internal regulations, and orders, as long as they are in force. This means that there can be no order (we do not consider anarchy to be a form of order because it lacks predictability) unless it is based on law and legal norms. In organizational theory, it is well established that the organization of labor and the complex relationships of cooperation within any organization require predictability in the work process, which can only be achieved through the application of valid legal norms. This indicates that the division of labor requires the existence of functional behavioral norms, which are developmental and changeable—just as the state itself is developmental and changeable—as has been demonstrated throughout the historical evolution of socio-economic formations in which states emerged: a) slave-owning, b) feudal, c) bourgeois, and d) proletarian types (Danilović, N.; Danilović, A., 2018: 7).

Many authors have classified and named these states as autocratic states, states governed by laws, legal states, and states in which the concept of the rule of law is present. In each of these types of states, there existed a legal system that reflected the interest-based relationship between those who wielded state power and those who were governed. This relationship is essential to the modern state and, therefore, for legal scholars, the continuous exploration of the relationship between the traditional state and law, and the modern state and modern law, is a desirable line of inquiry. Since this is a fundamental postulate, it is necessary to first consider the relationships between the following concepts: law, state law, modern law, and international law. In legal theory, there are numerous definitions of law, the epistemological analysis of which would require far more space than the scope of this paper allows. Analyzing the content of available definitions of law, one can conclude that they mostly refer to the terminological meaning of the concept of law as a general social phenomenon characteristic of the development of traditional societies and states. In the general sense of this concept, most authors define law as: “An internal, standardized process of every social community, necessary for the regulation of mutual relations among the members of that community, within which a sufficiently powerful group is formed to determine binding norms of behavior and to ensure their implementation in social practice, either by demonstrating justification, by threatening the use of force, or by actually employing force and violence” (Legal Encyclopedia, 1985: 686, 1050). Although this encyclopedic definition of law has its shortcomings, it nevertheless encompasses the essential elements of the concept of law that have existed from the most primitive forms of human communities to the present day. Therefore, due to the limited scope of this paper, we will not further expand the theoretical discussion on the concept of law (Danilović, N.; Danilović, A., 2018: 7).

2.3.2. The Meaning of the Concept of State Law

Closely related to the categorical concept of law is the derivative term *state law*. This term refers to an instrument of the state through which, by means of the constitution, laws, subordinate regulations, and decisions, the state regulates internal relations within society. From an epistemological standpoint, the term *state law* denotes a set of legal norms prescribed by the state that represent the will of the ruling class, and whose aim is to maintain the existing order (Danilović, N.; Danilović, A., 2018: 9). In modern states, state law is the primary means of protecting general social interests, including order, peace, and justice. State law protects the interests and expresses the will of the ruling structure, and its essential characteristic is state coercion.

However, in the process of implementing state law in modern states founded on the rule of law, numerous questions arise regarding the social role and ultimate scope of constitutions, the relationship between constitutions and international treaties, as well as the powers and responsibilities of governments to conduct and align certain policies with constitutional provisions. In such relationships, the realization of the fundamental legal postulate that in a state governed by the rule of law, everything that is not prohibited by law is permitted also comes into question.

“Our findings, as well as those of other authors, suggest that this legal postulate is untrue. Since the earliest written documents, legal norms have required the execution of specific actions for the benefit of the norm-makers and have obligated subjects to act in certain ways. Based on this fact, law cannot be attributed an exclusively or excessively restrictive function. In many cases, legal norms in modern states are stimulative and serve to promote development and progress, for which there are numerous examples” (Danilović, N.; Danilović, A., 2018: 9).

From an epistemological perspective, when considering legal norms that bind social subjects, two main criteria are taken into account: first, the time in which the norm was created, and second, the time in which it is applied, as well as the provisions of international legal norms. Hence, the creation and application of state law is a complex process in which the ruler enacts and imposes law through the prescription and enforcement of behavioral norms, while also taking into account the binding provisions of international law. The creation of norms that regulate behavior in modern states is not a process of arbitrary imposition of the will of ruling social elites. Rather, the maker of law is the institution of the legislative branch of government, composed of elected representatives (delegates) of the people, who are chosen through legally conducted elections based on universal suffrage (Danilović, N.; Danilović, A., 2018: 10). Legal and legitimate elections despite the possibility of manipulation provide an opportunity for citizens, to whom the norms apply, to express their free will. Therefore, it is necessary to ask whether state and international law serve as a substitute for justice according to the will of citizens and peoples in modern states. A broader discussion on this essential question would require appropriate answers to the complex theoretical and practical problems regarding the relationship between legality, electoral legitimacy, and justice issues that lie beyond the scope of this paper.

2.3.3. The Meaning of the Concept of Contemporary Law

Given that certain characteristics of modern states have significantly changed, for the purposes of this paper, we have derived the meaning of the term *contemporary law* from the basic elements of the general definition of law. This term denotes a social phenomenon characteristic of developed, modern democratic states, in which contemporary law is defined as “a systematized set of norms through which the state regulates the behavior of its citizens in their mutual relations, in order to achieve the essential interests of the state and society, the application of which is guaranteed by the entirety of the state’s power, including the threat or use of force” (Danilović, N.; Danilović, A., 2018: 8).

The presented working definition of the concept of contemporary law has epistemological value and meets all essential definitional criteria. This concept, as objectively valid, represents a creative intellectual reflection of the dialectical unity of the diverse components of law in modern states (Šešić, 1974). At its core, contemporary law, as a social construct, “ensures the establishment and maintenance of a democratic social order in many states, in which four fundamental functions of law are realized:

- [1] the **informative function**, through which one learns what is permitted and what is prohibited; what is good and what is evil; what is desirable and what is undesirable, etc.;
- [2] the **function of applying legal norms in social practice** and monitoring their implementation;
- [3] the **function of analyzing social conflicts and methods of overcoming them**; and
- [4] the **function of adapting norms to the needs of society and order**, as well as evaluating the effects of the functioning of law, the legal order, and the legal system in the modern state” (Blagojević, 1995: 4-86).

2.3.4. The Meaning of the Concept of International Law

Based on the analysis of numerous definitions, the most comprehensive and synthetic definition of the term *international law* is provided by Boris Krivokapić in his book *Current Issues of International Law*, where he defines international law as “a specific legal system that transcends national borders, emerges from the collective will of multiple subjects of international law, and regulates international public-law relations among states and certain international organizations, as well as certain internationally recognized rights and obligations of other subjects of international law” (Krivokapić, 2011: 27). In analyzing the relationship between the concepts of domestic law and international law, it may be concluded that domestic law refers to the legal norms applicable within a particular state, enforced through state power and coercion, whereas international law is a distinct type of law through which a state-via international organizations and its relations with other states establishes international standards and behavioral norms and assumes obligations to implement them within its legal system (Danilović, N.; Danilović, A., 2018: 10).

Considering the alarming state of disregard for basic norms of international law over the past 30 to 40 years, it is legitimate to ask: *Does the current state of affairs in international relations, characterized by the (non-)application of international law, provide sufficient grounds to assert the pronounced dominance of powerful states within international organizations and alliances—imposing their will and reshaping the world in accordance with their own interests?* If the answer is affirmative and all objective indicators suggest that it is then the question arises about the relationship between the sovereignty of modern states, their domestic law, and international law (Danilović, N.; Danilović, A., 2018: 11).

Examples of the abuse of international public law such as the disintegration of the Socialist Federal Republic of Yugoslavia (1991), the unlawful NATO aggression against the Federal Republic of Yugoslavia (1999), the illegal secession of Kosovo and Metohija from the Republic of Serbia (2008), the unlawful U.S. and NATO interventions in Iraq (2003), Libya (2011), and Syria (2025), as well as the unchecked eastward expansion of NATO disregarding Russia’s security concerns which triggered the war in Ukraine (2014-2025) have pushed the world to the brink of a civilizational conflict. These events have raised new legal and political questions about whether modern states truly uphold the rule of law or merely do so declaratively, and whether they actually respect codified norms of international public law in the practice of international relations.

Both theoretical and empirical evidence confirm that the unilateral recognition of the republics of the former Socialist Federal Republic of Yugoslavia and the secession of Kosovo and Metohija from the Republic of Serbia represented a precedent in international relations. The legal and political effects of such precedents have had far-reaching consequences for the future of international relations.

Just a few years after Kosovo's unilateral recognition, several regions around the world with ethnic or territorial disputes (such as Catalonia, Scotland, Abkhazia, South Ossetia, Crimea, Luhansk, and Donetsk) accelerated their pursuit of greater autonomy or independence, expecting support from international organizations and states. This precedent-setting environment in international relations was later used by Russia to legitimize similar unilateral processes of the secession of Crimea, and the Luhansk and Donetsk People's Republics, and their annexation to Russia, following numerous warnings about human rights violations against the Russian population in Ukraine. The consequences of these precedents have generated further conflict and tension, opening Pandora's box of interpretations regarding sovereignty, the right to self-determination, and the legitimate use of force leaving a lasting negative impact on the future of international relations. Respecting the epistemological principles of international relations theory and the legal principles of disciplines that fall under the narrower field of international public law, the question arises: *How will international organizations (UN, AU, EU, OSCE, and other regional organizations) demand consistent application of international law in similar future situations?* The case of Ukraine and the (non-)recognition of the Palestinian state confirms this most clearly. Furthermore, one must ask whether an elite that has come to power through legitimate and legal elections has the right, in the name of "higher interests" of integration into international organizations, to renounce the sovereignty of its people on its own territory. Any alteration to the legal system, or part of it, applied to a nation at the request of another state or international organization(s), constitutes a violation of that people's sovereignty.

Therefore, the unilateral efforts of certain countries to admit Kosovo into the United Nations clearly violate the sovereignty of the Republic of Serbia and are contrary to international law. The sovereignty of the people (citizens) over a given territory is the foundation of every modern democratic state. That is why this legal principle is enshrined in the constitutions of most countries, commonly expressed as: "All power in the state originates from the people and belongs to the people." According to an objective interpretation of law, *state sovereignty* implies a single, supreme authority over a given territory that is not dependent on any other (external) power. This authority is the highest in relation to its citizens and other entities within the state. Sovereignty implies that state authority is legally unbounded by external forces (such as another state), which fundamentally also implies the independence of the state. Thus, in addition to territory, established authority, and population, state sovereignty is one of the key attributes of a modern state. It is not possible to speak of a state, in the politico-legal sense, unless it is sovereign and, accordingly, independent (Danilović, N.; Danilović, A., 2018: 12).

The epistemological postulates of political and legal sciences require that the issue of state sovereignty be addressed in accordance with the provisions of international law and the generally accepted principles and theories of sovereignty both of internationally recognized states and of the people within those states. Otherwise, the world risks entering an era of instability and inequality in which the interpretation and creation of international law will be decisively influenced by the most powerful countries through the United Nations and other international organizations primarily the North Atlantic Council of NATO and regional international organizations such as the European Union, OSCE, and others. In practice, for decades, the establishment of legal order and governance in states with limited sovereignty has occurred according to models shaped by the most powerful countries or coalitions, whose influence remained embedded within those territories (Noam, 1996: 279-285). Under certain historical circumstances, the most influential states of the international community either did not apply or selectively applied the provisions of international law, while in other contexts, these norms were interpreted and enforced in line with their strategic interests.

Thus, the long-term reality of international relations confirms the premise that the interpretation of international law has been flexible, elastic, biased, and shaped by the interests of the most powerful states. With numerous examples and evidence, one can confirm the hypothetical assumption that the application of certain provisions of international law has not adhered to principles of equality and fairness, but has instead allowed modern states to interpret and apply the law “freely” and differently, based on their global interests. The best example of this was the interpretation and application of the UN Charter provisions, which were used to justify armed interventions in Iraq, Libya, and the brutal aggression against the Federal Republic of Yugoslavia in 1999, as well as the fabricated accusations of the use of chemical weapons by government forces in Syria. In the newly established international relations especially during the period of bipolar world division a tacit pattern emerged: a state would first be accused without evidence, followed by propaganda-driven tension, then sanctions, and finally aggression or military intervention against that sovereign state (Danilović, A.; Danilović, N., 2018: 15). Such a state of international affairs, in which international law is disregarded due to conflicting interests, represents the primary source of the need to strengthen sovereign states and reaffirm international organizations especially the United Nations with a strategic role in ensuring genuine respect for international law and consistent realization of the concepts of the “rule of law” and the “legal state.”

2.4. The Meaning of the Terms “Rechtsstaat” and “Rule of Law”

The terms *Rechtsstaat* (legal state) and *rule of law* refer to politico-legal models and concepts that all democratically governed states around the world strive to achieve. In the political and legal theory of modern states, these models and concepts are variously defined and insufficiently elaborated in scientific literature, which is why they represent a central subject of research in this paper. The model of the *Rechtsstaat* and the concept of the *rule of law* are often used as synonyms, although there are subtle differences in their meanings. At their core, both the model and the concept designate a fundamental principle according to which all institutions, bodies, and organizations in modern states including the government are subject to and bound by the law.

According to most scholars who study the meaning of these terms (Lon L. Fuller, Friedrich Hayek, John Rawls, Joseph Raz, Ronald Dworkin, Thomas Bingham, Martin Krygier, Brian Tamanaha, Cass Sunstein, and others), both legal concepts are based on the following fundamental principles:

- a) **The rule of law and not of men**, which means that legitimately elected authorities do not govern arbitrarily but on the basis of clearly defined, publicly promulgated, and applicable laws adopted by national parliaments, and which apply equally to all, regardless of their social status or power.
- b) **Equality of all citizens before the law**, whereby everyone has equal rights and obligations, without privileges or discrimination.
- c) **Separation of powers** into legislative, executive, and judicial branches, where each branch has its own social function and they mutually check and balance one another, thus preventing abuse of power.
- d) **An independent judiciary**, authorized to interpret and apply the law and to protect the rights and freedoms of citizens.
- e) **Guarantee, respect, and protection of human rights and fundamental freedoms**, as prescribed by the Universal Declaration of Human Rights and modern state constitutions.
- f) **Clarity, predictability, and stability of enacted laws**, which must be clear, understandable, publicly promulgated in advance, and stable (long-lasting), so that citizens can anticipate the consequences of their actions.

g) **The existence of effective mechanisms for access to justice**, including legal remedies and efficient courts, where citizens can freely seek protection of their rights.

h) **Accountability of governments and public officials for their actions**, with clearly established mechanisms of accountability (parliamentary oversight, free media, independent bodies, civil society organizations, etc.).

The key difference in meaning between the terms *Rechtsstaat* and *rule of law* lies in the fact that *Rechtsstaat* emphasizes the role of the state in protecting individual rights, implying the active engagement of the state in ensuring justice and welfare, with adherence to law, and is most often associated with the idea of social justice. On the other hand, the *rule of law* highlights the limitation of government power and the protection of individual liberties.

2.4.1. The Meaning of the Term “*Rechtsstaat*”

In academic discussions, various approaches and interpretations of the term *Rechtsstaat* can be found. The **formal (or “narrow”) interpretation** emphasizes the formal aspects of the *Rechtsstaat*, such as the generality of laws, their public promulgation, applicability, and stability. This interpretation does not delve into the content of the law, but only into how laws are enacted and applied. The **material (or “broader”) interpretation**, in addition to formal features, includes the content of the law, which must be just and based on the principles of human rights and fundamental freedoms. Many authors argue that the *Rechtsstaat* presupposes a certain level of social justice. Accordingly, different schools of thought have developed around the concept of the *Rechtsstaat*, including the liberal, conservative, and socially-oriented versions. In the formal-legal sense, the *Rechtsstaat* refers to “a state in which all subjects are equally bound by law and where there exists a developed system of universally binding norms, an independent judiciary, and a sovereign representative body the legislature that acts in all cases in accordance with the principle of legality” (Danilović, A., Danilović, N., 2018, p. 18). In the material-legal sense, the *Rechtsstaat* is “a state in which the subject, who previously had only obligations and no rights, is replaced by the citizen, who is both a holder of rights and obligations, thereby fundamentally changing the role of modern state power, which becomes democratic while retaining narrow or broad interventionist powers, but with the added obligation to ensure that such interventions do not endanger citizens’ freedoms and rights” (Danilović, A., Danilović, N., 2018, p. 18). The synthesis of formal and material legal interpretations of the *Rechtsstaat* lies in the notion of a modern legal state where no individual or group governs, but rather the law itself prevails, and where all natural and legal persons are obliged to comply with objective legal norms. At the foundation of all definitions of the *Rechtsstaat* lies democracy, freedom, and equality, as formulated by Aristotle in his work *Politics*, in which he states: “Equality according to law consists in the fact that the poor have no greater claim to power than the rich, and that supreme power does not belong exclusively to either. For if in a democracy, as some think, the most important elements are freedom and equality, then this can be achieved if all have as equal a share as possible in state governance. And since the people are the majority, and the decision of the people is the supreme law, then such an order must be a democracy” (Aristotle, 1976, p. 37). The very concept of the *Rechtsstaat* implies that the actions of state authorities are transparent, rational, measurable, and predictable, subject to oversight and accountability, and grounded in ethics and morality. From the perspective of its significance and application, the *Rechtsstaat* is important for the protection of individual freedoms and rights, for ensuring a predictable business environment crucial for economic development and investment, for peace and stability by preventing abuse of power and arbitrary decision-making, and for the realization of democracy without which no modern legal state can exist. Its essential values include:

- [1] Personal and legal security and certainty, including physical and psychological safety, social freedom, and inviolability of property;
- [2] Equality of all citizens before the state and the law, regardless of their personal and collective characteristics;
- [3] Protection from state arbitrariness in the pursuit of success and human happiness;
- [4] Developed democratic forms and mechanisms of governance that ensure a stable state order;
- [5] Separation of powers into legislative, executive, and judicial branches that are mutually independent and exercise checks and balances;
- [6] Free elections through which state authority is legitimately chosen by the will of the people, limited by the constitution and laws, and respecting the principles of constitutionality and legality;
- [7] Political pluralism with developed methods and means of civilized communication, sincere dialogue, and compromise solutions based on tolerance;
- [8] Independence of the judiciary, before which all public officeholders are legally accountable;
- [9] Recognition and respect for human rights and freedoms;
- [10] Limitations of state sovereignty by internationally recognized standards of human rights protection.

2.4.2. *The Meaning of the Term “Rule of Law”*

The existing body of social science theory confirms that it is impossible to achieve the fundamental values of a modern legal state without the realization of the “rule of law.” Since this term is most often equated with the term “legal state,” this section presents an overview of the positions of influential global authors on the concept of the rule of law. Lon L. Fuller, in his work *The Morality of Law* (1964), developed the concept of the “inner morality of law.” He argues that a legal system must adhere to eight principles in order to be legitimate and to qualify as “legal.” These principles include: generality (laws must be general), publicity (laws must be publicly known), prospectivity (laws must apply to future actions), clarity (laws must be understandable), consistency (laws must not contradict one another), feasibility (laws must be possible to comply with), stability (laws must not change too frequently), and congruence between legal rules and their application (Fuller, 1964). Friedrich Hayek was a strong advocate of the “rule of law” as a foundation for a liberal society and economic progress. He argued that the “rule of law” means that everyone, including the government, is subordinate to general, abstract, and pre-established rules. This prevents arbitrary government action and ensures individual liberty (Hayek, 1978, 2007, 2022; Bingham, 2010; Tamanaha, 2004). John Rawls developed the theory of justice as fairness. He argued that a just society should be based on principles that would be chosen in the “original position,” behind a “veil of ignorance.” These principles include: the principle of equal basic liberties, the difference principle (social and economic inequalities are acceptable only if they benefit the least advantaged), and the principle of fair equality of opportunity (Rawls, 1971, 1993, 2005). Joseph Raz developed the theory of the “rule of law” as a moral ideal. He argued that the rule of law consists of eight principles, including that laws must be: (1) prospective, clear, and public; (2) relatively stable; (3) enacted and applied according to clear procedures; (4) enforced by an independent judiciary; (5) accompanied by easy access to justice; (6) based on the guarantee of judicial independence; (7) consistent with the principles of natural justice; and (8) subjected to checks in their application (Raz, 1973, 1990, 1998, 2009). Ronald Dworkin developed the theory of law as integrity. In his works, he argued that judges should not only apply existing laws, but also interpret and develop the law in a way that is coherent and respects principles of justice and equality (Dworkin, 1977, 1986). Starting from the premise that it is necessary to distinguish this concept from the meaning of the term *legal state*, we offer in this section a workable, synthetic definition of the rule of law:

“The rule of law is the idea and aspiration of a free and progressive society for a state-legal order based on social justice, which affirms the citizen as an active actor of government within the framework of a representative democratic system, relying on the reasonableness of citizens, the growth of their freedom and dignity, and the capability of the state-legal system to continually improve the conditions for desired progress.” (Danilović, A., Danilović, N., 2018, p. 19)

Although this proposed working definition of the term “rule of law” may be subject to criticism, it contains all the essential elements of the concept without favoring any particular theoretical stance from the traditions of continental, Anglo-Saxon, or Sharia law. On the contrary, the definition provides a sound basis for addressing existing difficulties in implementing the model of the “legal state” and its “rule of law” concept. Future modern legal states will be based on these models and concepts, which will continue to evolve and adapt under the influence of new knowledge and real geopolitical, social, economic, political, legal, socio-cultural, and security developments in contemporary states. The current and projected trends of these changes do not yet provide sufficient scientific evidence for a reliable and valid prediction of the depth and scope of these changes in the near or distant future. Therefore, the concept of the “rule of law,” caught in the jaws of bipolar and multipolar world orders, remains a significant issue and subject of future research.

3. TENDENCIES IN THE REALIZATION OF THE “RULE OF LAW” IN THE BIPOLAR AND MULTIPOLAR CONCEPT OF WORLD ORDER DEVELOPMENT

3.1. Tendencies in the Realization of the Rule of Law Model in the Bipolar Concept of World Order Development

The bipolar concept of world order development coincides with the Cold War period, beginning after the end of World War II, specifically from 1947, until the dissolution of the Warsaw Pact in 1991. In the realization of the “rule of law” and the “Rechtsstaat” within this concept, several tendencies can be identified within three groups of countries. Within the Western bloc, led by the United States, the notions of the “Rechtsstaat” and the “rule of law” were used during the Cold War as political tools and main arguments to demonstrate the superiority of the Western system over the Eastern one. These legal models promoted guarantees of individual freedoms, democracy, and economic progress. In promoting the “rule of law” model, formal aspects dominated, such as the general applicability of laws, their enforceability, and transparency. Throughout the Cold War, double standards were often employed, with the West frequently supporting authoritarian regimes in allied countries fighting communism, thus neglecting the principles of the “Rechtsstaat” and the “rule of law” in those contexts. The focus was primarily on Western European and North American countries, which were presented as examples of developed “rule of law” systems, characterized by an independent judiciary and established principles of separation of powers, democracy, and human rights protection.

In contrast, the Eastern bloc, led by the USSR, promoted socialist legality, emphasizing the subordination of law to ideology and the goals of the Communist Party. Laws were used as instruments to enforce party policy. Power was centralized, and the judiciary operated under party influence. Human rights and fundamental freedoms were restricted, and criticism of the government was punished. These legal systems generally suffered from a chronic lack of the “rule of law,” with occasional repression, although this was not uniformly the case across all countries' legal and political systems.

3.2. Tendencies in the Realization of the Rule of Law Model in the Multipolar Concept of World Order Development

The multipolar concept of world order development formally corresponds with the post-Cold War period. This period saw a strong emphasis on promoting the development of the “Rechtsstaat” model. International organizations (UN, World Bank, IMF) promoted the “rule of law” as a condition for economic development, investment, and democratic transition. Democracy and the political concept of democratic peace were promoted, according to which countries that developed a rule of law model were unlikely to go to war with each other. International law developed significantly, including the establishment of the International Criminal Court, as an attempt to ensure accountability for human rights violations and breaches of international law more broadly. Numerous institutionalized programs were created to strengthen the “rule of law” in transitional and developing countries. Western countries frequently criticized states that had not developed all the elements of the “Rechtsstaat” in their legal systems, although they themselves often violated the principles of the rule of law particularly in the context of counter-terrorism efforts or geopolitical interests. In the development trajectories of former Eastern bloc countries, a rise in populism and authoritarianism emerged, marked by slowed progress in developing the “rule of law.” In both blocs, new global challenges particularly climate change, mass migration, and pandemics placed continuous pressure on the rule of law to provide adequate and effective responses. Economic and social issues gave rise to increased critical discourse questioning whether the rule of law could effectively address problems of economic inequality and social injustice. Moreover, the influence of other global powers on international relations increased during this period, particularly that of China and Russia. The People's Republic of China demonstrated a strong emphasis on state strengthening, frequently utilizing a model distinct from the Western version of the rule of law. Its focus was on economic and technological development, as well as maintaining societal stability, while limiting individual freedoms and political pluralism. Conversely, Russia was frequently criticized for failing to establish the rule of law and for its authoritarian governance style, although it continued to grow economically, technologically, and militarily. The transition in Eastern European countries and the former Soviet Union progressed gradually. Throughout this transition, the influence of the “rule of law” on economic growth and democracy steadily increased in line with the specificities of each country. The post-Cold War period also witnessed an intensified globalization process, which influenced the harmonization and alignment of legal systems and rule of law standards across various countries. Globalization led to increased interdependence among states in terms of exchanging ideas and practices concerning the rule of law. Many developing countries often adopted norms from developed states but adapted them to their own needs and local contexts. Cultural and historical particularities influenced how normative frameworks were shaped and implemented in different countries, resulting in diverse approaches to the rule of law. Regional organizations and initiatives promoted specific norms and standards, leading to further diversification from global benchmarks, as many countries developed their own rule of law models. The emergence of new centers of power altered the global balance, affecting which norms were applied and how they were interpreted. Developing countries had differing priorities regarding the rule of law, resulting in a diversification of this legal model. Shifts in the global balance of power also impacted international organizations and their ability to promote the rule of law. In some cases, new powers were less inclined to cooperate within existing international institutions, hindering global efforts to strengthen the rule of law. Some new power centers supported countries striving to strengthen the rule of law, while others backed authoritarian regimes violating human rights. This support influenced domestic political dynamics and the capacity of civil society to advocate for legal reform. Changes in the global balance of power were also reflected in the implementation and observance of the rule of law across various countries and regions.

With the emergence of new power centers, norms and standards for the rule of law became increasingly diversified. Heightened competition between old and new power centers led to geopolitical rivalries that affected compliance with the rule of law, with some cases showing a willingness to disregard or relativize the rule of law to achieve strategic interests or alliances. In countries involved in conflicts or competing for geostrategic influence, legal norms and principles were often neglected, with authorities making decisions contrary to the rule of law in pursuit of political or military objectives. In many instances, geopolitical rivalries placed pressure on judicial institutions, where decisions were made based on political considerations rather than the law. International pressure or sanctions sometimes affected domestic legal systems, weakening the rule of law in those states. As a result, many countries promoted alternative approaches to building and applying the rule of law, which impacted the established values and standards on the global level. Furthermore, changes in the global power balance affected the abilities of international organizations to promote the rule of law through various mechanisms and activities, primarily including: the development of standards and guidelines; monitoring and evaluating the state of the rule of law in member states; providing support, training, technical assistance, and resources to strengthen judicial systems and civil society institutions; exerting diplomatic pressure on governments to initiate necessary reforms; offering financial assistance through rule of law-related projects; and promoting cooperation and dialogue among member states and other actors to exchange best practices and experiences in the field of the rule of law. Thanks to technological advancements, digitalization and new technologies had a significant impact on legal processes and access to justice. They enabled faster and more efficient processing of legal documents, improved accessibility to legal information and resources, shortened case resolution times, facilitated access to justice, and helped citizens better understand their rights and obligations. However, the influence of digitalization and new technologies on legal processes also posed challenges, such as issues of privacy, data security, and digital literacy.

4. SIMILARITIES AND DIFFERENCES IN THE IMPLEMENTATION OF THE "RULE OF LAW" BETWEEN THE BIPOLAR AND MULTIPOLAR CONCEPTS OF GLOBAL ORDER DEVELOPMENT

Based on the analysis of available sources regarding the implementation of the “rule of law” concept, this paper identifies the fundamental similarities and differences between proponents of the bipolar and multipolar models of global order development.

4.1. Similarities in the Implementation of the “Rule of Law” Concept

In terms of basic principles, both the bipolar and multipolar concepts regard the “rule of law” and the notion of the “legal state” as fundamental postulates for the protection of human rights, legal security, and democratic governance. There is a shared commitment to promoting institutional integrity and ensuring government accountability. Both models acknowledge the importance of international law and conventions as means and significant tools for strengthening the legal state and the rule of law. International treaties and human rights conventions are relevant to all countries, whether within a bipolar or multipolar context. In both blocs, efforts are made to improve legal systems and ensure access to justice, although the methods and means of achieving these goals differ to some extent.

4.2. Differences in the Implementation of the “Rule of Law” Concept

During the Cold War period (1947-1991), within the bipolar global order, the legal state and rule of law were frequently employed as ideological instruments in the conflict between East and West. The Western bloc promoted these legal models as integral elements of liberal democracy, while the Eastern bloc often viewed them as tools for liberal capitalist domination.

In contrast, the multipolar concept of global development allows for the coexistence of diverse models of the legal state and interpretations of the rule of law. Powerful countries such as China and Russia have advanced their own versions of the legal state, often emphasizing state sovereignty and economic stability over individual human rights and political freedoms. Regarding the implementation of these legal models, the bipolar concept frequently promoted the rule of law through mechanisms of international aid and pressure initiated by Western countries or leading international organizations. These efforts often aimed to establish and support independent judiciaries, free media, and civil society organizations. On the other hand, the multipolar model, with its varied views on national sovereignty, tends to prioritize collective rights and societal stability over individual rights and freedoms. In this context, the rule of law is understood more as a means for preserving order and protecting fundamental rights. In their approaches to human rights, countries aligned with the bipolar concept often faced international pressure to comply with human rights standards established by the developed Western nations. In contrast, countries operating within the multipolar framework advocate for differentiated approaches to human rights, aligned with their domestic policies and cultural patterns. As for the evolution of the legal state and rule of law models, the bipolar concept established a more precisely defined legal framework, with clear distinctions between democratic and authoritarian governance. The concept of the rule of law was closely associated with liberalism and Western values. In the multipolar world, these models and concepts have become diversified, with various countries developing their own interpretations of the legal state and the rule of law according to the nature of their political systems, cultural values, and traditions. From the analysis of these positions and judgments regarding similarities and differences, it can be concluded that there is a distinct divergence between the proponents of bipolar and multipolar concepts of global development in their approaches, ideological foundations, and priorities concerning the implementation of the legal state and the rule of law. In the bipolar concept, these legal models had clearer definitions and were employed as tools in ideological conflict. In contrast, the multipolar concept has led to adaptation and diversification, wherein various states emphasize their own interpretations and applications. From both an epistemological and practical standpoint, these similarities and differences in the construction and application of the legal state and the rule of law are of great importance for understanding global political dynamics and for identifying opportunities to enhance legal systems around the world.

5. CONCLUSION

The subject of this paper is the “rule of law” within the context of bipolar and multipolar models of global order development. The issues of the “legal state” and the “rule of law” have been the focus of scholars from various backgrounds, from antiquity to the present day. However, these models and concepts have never been fully developed in theoretical terms. Within different legal systems (Anglo-Saxon, continental, and Sharia), they have been understood and interpreted differently-and in many cases, equated. Starting from this initial premise, the paper has offered acceptable definitions of the core categorical terms from which the concepts of the “legal state” and the “rule of law” are derived, differentiated them from related terms, uncovered trends, and identified similarities and differences in the implementation of these concepts within the bipolar and multipolar models of global order development. Through the analysis of scholarly sources, the study concludes that the legal state model and the rule of law concept were key elements in the bipolar world order. The Western bloc promoted these models as part of its ideological and political strategy, while the Eastern bloc adopted a different approach. In the post Cold War period, the legal state and rule of law became global objectives but also a contested domain of political struggles and controversies.

The multipolar world order has given rise to new centers of power (China, Russia, India, Brazil, and others) that hold diverse views on the legal state and rule of law, as well as their implementation in social practice. For this reason, continued research is necessary to better understand the evolution of these essential legal models and concepts in contemporary states and legal systems. Regarding adherence to generally accepted principles of international law, the findings suggest that approaches are shaped by differing ideological foundations, power interests, and interpretations of legal norms. While the bipolar order was marked by ideological confrontation and selective application of law, the multipolar order has seen states act to protect their interests, leading to a varied relationship with international law and its implementation. This development presents both a challenge and an opportunity—on the one hand, it complicates the establishment of a fairer and more effective global order, while on the other, it creates the potential for building a more balanced and inclusive international system. Moreover, based on the research findings, it can be concluded that not all countries within the bipolar and multipolar world orders are equally positioned or equally capable of ensuring the conditions necessary for the development of the legal state model and the rule of law concept. These elements are in direct causal connection with the overall level of political, economic, social, cultural, informational-communicational, and technical-technological development of modern states, as well as with the geopolitical context of international relations. From the entirety of the research findings, the general conclusion emerges that the concept of the rule of law must be more thoroughly theoretically elaborated and operationalized in order to become a realistic and achievable goal in all contemporary states. The core of this future concept will consist of: (1) citizens individually and collectively as the creators of the state and the law; (2) sovereign and independent modern states and their legal systems, whose primary function is to protect citizens and the legally established social order from all forms of threats and to facilitate their development, prosperity, and well-being; and (3) international organizations, whose fundamental purpose is to provide adequate mechanisms for resolving disputes among citizens, social groups and classes, states, and nations in a tolerant atmosphere, through peaceful means—dialogue, negotiation, and compromise without armed uprisings, conflicts, military interventions, or wars.

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APPLICATION OF DEEP LEARNING MACHINE TRANSLATION FOR TRANSLATION FROM ENGLISH TO SERBIAN LANGUAGE

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ABSTRACT

Artificial intelligence-based machine translation has significantly advanced traditional translation methods. Modern machine translation systems are highly useful for converting text or speech from one language to another. Early machine translators operated on word-for-word substitution principles, often producing unnatural results. However, high-quality translation requires not only transferring individual words but also understanding the full sentence context to preserve the original meaning. In this study, we investigated English-to-Serbian translation techniques using deep learning methods, including: Recurrent Neural Networks (RNN), Long Short-Term Memory networks (LSTM), Gated Recurrent Units (GRU), Attention mechanisms, Transformer models. The deep learning-based machine translators were compared based on translation accuracy. Results demonstrated that the Attention mechanism achieved the best performance with 98.8% accuracy, while the Transformer model ranked second with 98.5% accuracy.

Keywords: *Machine translation, Deep learning, RNN, LSTM, GRU, Attention, Transformer*

1. INTRODUCTION

With the increasing volume of diverse data in the modern world, extracting useful information becomes crucial for making precise decisions in the learning and management processes. Certain types of data, such as images, text, and speech, tend to develop more rapidly, requiring the application of more advanced technologies and algorithms for their processing [1]. The capabilities of modern computers are continuously expanding to enable the processing of large datasets, including images, text, speech, and audio recordings, which are generated in enormous quantities every minute. At the same time, numerous applications are being developed daily for organizing, analyzing, and solving problems related to data processing. In earlier stages of development, hardware was the primary resource for storing information and solving procedural problems. However, advancements in computer technologies have enabled the connection of multiple computers into distributed systems, significantly accelerating the resolution of complex tasks. Additionally, the use of cloud computing resources allows for memory space savings. Scientists estimate that the volume of data will continue to expand exponentially compared to existing technological capabilities. Although most data can be stored and processed through hardware and software solutions, large datasets may become too extensive for standard memory capacities [2]. Understanding the structure and content of data can help in making optimal decisions, reducing costs in terms of time and financial resources.

The application of deep neural networks for text analysis, including translation and interpretation, represents a modern approach that enables more efficient expression and communication. Some researchers have conducted experiments with machine translation models, comparing their performance in translating from English to Serbian and vice versa. In [3], two models were proposed: ConvS2S based on RNN (recurrent neural networks) and Transformer, also based on RNN. The results showed that the Transformer model achieves the best performance with an appropriate batch size and optimal learning rate. However, this model has not been fully examined in all aspects to determine the most efficient translation method. With the advancement of technology and algorithms, text analysis is becoming increasingly important for understanding natural languages. In this research paper, deep learning models for machine translation from English to Serbian are examined. Five models were tested: RNN, LSTM, GRU, the attention mechanism, and Transformer. The goal was to compare their performances to determine the most efficient approach for English-Serbian text translation. Additionally, the paper explores new methods in text analysis and English-to-Serbian translation. For the authors of this paper, applying machine translation to Serbian posed a significant research challenge due to:

- The inflectional nature of the Serbian language (complexity of cases and verb forms);
- Smaller available corpora compared to English;
- Dialectal and orthographic variations (Ekavian/Ijekavian, Cyrillic/Latin scripts).

Machine translators are useful tools but often require human correction for professional translations.

1.1. Research Methodological Framework

The goal of this research is a comparative analysis of the performance of different neural architectures for machine translation from English to Serbian. Specifically, the study has the following objectives [1]:

- Compare the accuracy and efficiency of the following models: RNN, LSTM, GRU, Seq2Seq with Attention mechanism, Transformer, and TFBert.
- Identify the best architecture based on the metrics: BLEU score, chrF (Character F-score), and Cross-Entropy Loss.
- Analyze the stability and convergence speed during training over 50 epochs.
- Determine the optimal relationship between model complexity and translation quality for the English-Serbian language pair.

Main Hypothesis: "Transformer and BERT-based models (TFBert) will achieve significantly better results than traditional recurrent architectures (RNN, LSTM, GRU) in machine translation from English to Serbian."

Supporting Hypotheses:

- **H1:** "TFBert will have the highest BLEU score and the lowest loss due to its ability to capture deep contextual dependencies."
- **H2:** "Transformer will be more stable than Attention-based models, with smaller oscillations during training."
- **H3:** "GRU will outperform LSTM in training speed and loss stability, with slightly better performance."
- **H4:** "RNN will have the lowest metrics due to its limited ability to retain long-term dependencies."

Previous Research

Existing research in the field of machine translation (NLP) indicates the following [2]:

- RNN, LSTM, and GRU have traditionally been used for sequential tasks but have limitations in processing long sentences (Hochreiter & Schmidhuber, 1997; Cho et al., 2014).
- Attention mechanisms improve Seq2Seq models by focusing on key parts of the input (Bahdanau et al., 2015) but require more computational resources.
- The Transformer architecture (Vaswani et al., 2017) revolutionized NLP tasks thanks to its self-attention mechanism, enabling parallel processing and better context capture.
- BERT and its variants (Devlin et al., 2018) set new benchmarks in translation due to bidirectional training and deep contextual representations.

Limitations of Previous Research:

- Most studies focused on high-resource language pairs (e.g., English-French), while English-Serbian has been less explored.
- There is no consensus on the optimal architecture for less-represented languages like Serbian, which has more complex morphology.

Methodological Contribution of This Research

This study contributes by:

- Conducting a systematic comparison of six different models on the WMT16 English-Serbian corpus.
- Providing quantitative and qualitative analysis of translations (e.g., errors in gender, tense, syntax).
- Experimentally validating whether the latest architectures (Transformer, BERT) justifiably require greater computational resources for marginally better results compared to simpler models.

In conclusion, this research continues the tradition of evaluating neural networks for machine translation but with a focus on the specificities of the Serbian language, providing valuable insights for future implementations.

2. MACHINE TRANSLATION

Machine Translation (MT) is a computer program or system that automatically translates text or speech from one natural language to another without human intervention [3,4]. It uses artificial intelligence (AI) algorithms and models to perform translation. Machine translation is designed for:

- Quickly translating large volumes of text (e.g., documents, web pages);
- Facilitating communication between people who do not speak the same language;
- Assisting professional translators (as a supporting tool);
- Integration into software systems (e.g., translating chats, emails);
- Aiding foreign language learning.

Today, we distinguish the following types of machine translators:

1. **Statistical Machine Translation (SMT):** Uses statistical models based on large corpora of translated texts. Example: Google Translate (earlier versions).
2. **Rule-Based Machine Translation (RBMT):** Relies on linguistic rules and dictionaries. RBMT is further divided into:
 - *Rule-based* (uses grammatical rules)
 - *Dictionary-based* (relies on predefined dictionaries).

3. **Neural Machine Translation (NMT):** Uses deep learning neural networks to translate entire sentences in context, producing more natural and accurate translations. Examples: DeepL, modern Google Translate, Yandex.Translate.
4. **Hybrid Machine Translation:** Combines multiple approaches (e.g., SMT + NMT) for better results.
5. **Adaptive Model Translators:** Specialized for specific domains (e.g., medicine, law).

Currently, several tools support English-Serbian translation, including:

- **Google Translate (NMT)**
- **DeepL (NMT, limited language support)**
- **Yandex.Translate**
- **SrbTrans** (a specialized translator for Serbian).

Thanks to ongoing research, existing MT systems are continuously improving, enabling users to obtain increasingly accurate translations. Advances have been made in computational capabilities, research methods, tools, and algorithms. A well-performing MT system is typically based on an encoder-decoder structure [2].

In this study, the authors analyze the machine's function in building models, and MT will be evaluated using algorithms to recognize language outputs from inputs. MT has played a crucial role in applying the recurrent neural network (RNN) to the encoder-decoder model, particularly in language model translation (as illustrated in Figure 1).

2.1. Concept, Purpose, and Types of Deep Learning for English-to-Serbian Translation

Deep Learning (DL) is a branch of machine learning (ML) that uses artificial neural networks with multiple layers (deep neural networks) to automatically learn from data. Inspired by the structure of the human brain (neural networks) [5], deep learning requires large amounts of data and computational power. It is used for pattern recognition in images, text, speech, and more.

Applications of Deep Learning

Deep learning is applied in various fields, including:

- Image and video recognition (e.g., facial recognition, medical diagnostics).
- Natural Language Processing (NLP) – machine translation, text generation, chatbots.
- Recommendation systems (e.g., Netflix, YouTube algorithms).
- Autonomous vehicles (object detection in traffic).
- Generative AI (e.g., GPT, DALL-E, deepfake technologies).

Types of Deep Learning

Today, the following types of deep learning are distinguished:

1. **Convolutional Neural Networks (CNN)** – Used for image and video analysis (e.g., object detection, medical imaging).
2. **Recurrent Neural Networks (RNN)** – Suitable for **sequential data** (e.g., text, speech).
Key RNN variants include:
 - **LSTM (Long Short-Term Memory)**
 - **GRU (Gated Recurrent Unit)** – Better at retaining long-term dependencies.
3. **Transformer Models** – A modern architecture for text processing (e.g., BERT, GPT). Uses an **attention mechanism** for better contextual understanding.
4. **Generative Adversarial Networks (GAN)** – Consists of two networks (**generator & discriminator**) that "learn" through competition. Used for generating realistic images, videos, and deepfakes.

5. **Autoencoders** – Used for **dimensionality reduction** and **anomaly detection**.
6. **Reinforcement Learning (RL)** – A model that learns through **trial and reward** (e.g., AlphaGo, robotics).

Examples of Deep Learning in Practice

Some notable applications include:

- Google Translate (neural machine translation).
- ChatGPT (transformer-based text generation).
- Tesla Autopilot (object recognition while driving).
- DeepFace (Facebook) – Facial recognition.

Challenges in Deep Learning

Despite its advancements, deep learning faces several challenges:

- Requires large datasets.
- Computationally expensive (needs GPU/TPU chips).
- "Black box" problem – Difficulty in explaining model decisions.
- Ethical concerns (bias in data, AI misuse).

Conclusion: Deep learning is a revolutionary technology enabling advanced data analysis and automation of complex tasks. It is widely used across industries-from medicine to finance-but also faces challenges related to resource demands and ethical considerations.

2.2. Recurrent Neural Network (RNN)

A Recurrent Neural Network (RNN) is a type of artificial neural network designed for processing sequential data where temporal or sequential dependencies exist.

- **Key characteristic:** It possesses "memory" - the output from the previous step influences the current one.
- **Used for:** Data where sequence matters (text, speech, time series).
- **Application examples:** Machine translation, text generation, sentiment analysis.

RNN is employed in tasks where context is important, such as:

1. Natural Language Processing (NLP)
 - Translation (e.g., earlier versions of Google Translate).
 - Text generation (e.g., predicting the next word).
 - Sentiment analysis (e.g., detecting emotions in text).
2. Time Series and Forecasting
 - Stock market predictions, weather forecasting.
3. Speech Recognition
 - Speech-to-text conversion (e.g., Siri, Google Assistant).
4. Image Captioning**
 - Generating descriptive captions for images.

Types of Recurrent Neural Networks (RNNs):

1. Basic RNN (Vanilla RNN)
 - The simplest form but suffers from the vanishing gradient problem-difficulty in remembering long-term dependencies.
 - Example: Simple models for sequence prediction.

2. LSTM (Long Short-Term Memory)

- An advanced RNN variant with gates that control memory.
- Solves the long-term dependency problem.
- Used in:
 - Machine translation (e.g., older Google Translate models).
 - Speech recognition.

3. GRU (Gated Recurrent Unit)

- A simplified version of LSTM, faster to train.
- Fewer parameters but performs well on many tasks.
- Commonly used in modern NLP models.

4. Bidirectional RNN (Bi-RNN)

- Processes data in both directions (forward and backward) for better contextual understanding.
- Used in text analysis models.

5. Hierarchical RNN

- Uses multiple RNN layers to process more complex sequences.

Key Advantages of RNNs:

- Suitable for sequential data.
- Can "remember" previous information.

Main Limitations of RNNs:

- Slow to train on long sequences.
- Issues with vanishing/exploding gradients.
- Largely replaced by transformers (e.g., BERT, GPT) in NLP.

RNNs were revolutionary for sequential data processing, especially in NLP, but have been partially surpassed by transformers. However, they are still used in specific applications, and LSTM & GRU remain crucial for understanding neural network evolution.

Figure 1 shows a diagram of different RNN types.

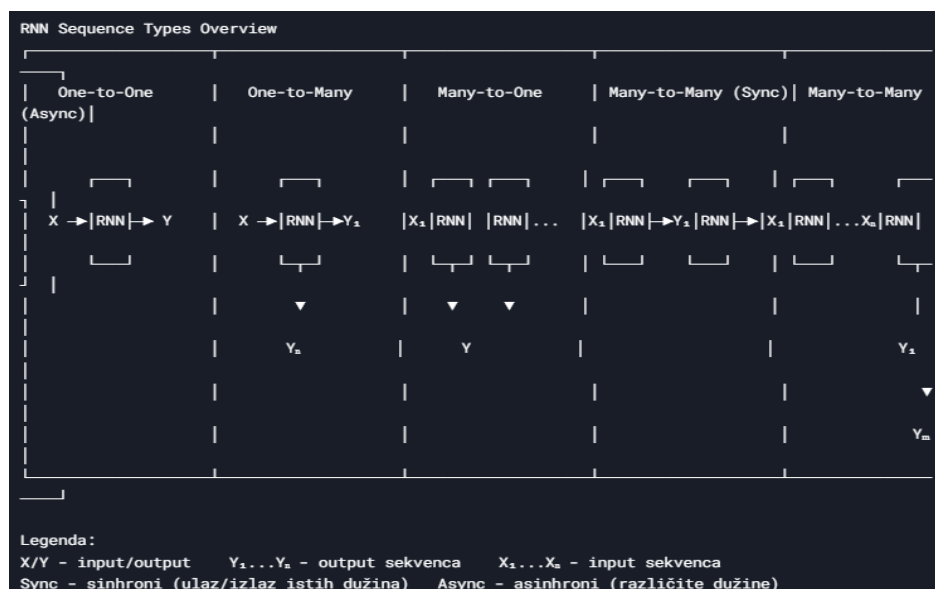


Figure 1.: Diagram of different RNN sequence types

Basic Characteristics of RNN Sequences:

- One-to-One: Classic non-recurrent network;
- One-to-Many: One input generates a sequence (e.g., text generation);
- Many-to-One: A sequence is compressed into a single output (e.g., sentiment analysis);
- Many-to-Many (Sync): Input and output are aligned (e.g., part-of-speech tagging);
- Many-to-Many (Async): Encoder-decoder architecture (e.g., machine translation).

In Figure 2, the following component labels are provided:

1. Input (X_t): Feature vector for time step t (e.g., a word in a sentence, a value in a time series).
2. RNN Cell Contains:
 - Weights (W): Shared across all time steps;
 - Activation function (e.g., tanh or ReLU);
 - Feedback loop combining the current input (X_t) and the previous hidden state (h_{t-1}).
3. Hidden State (h_t): The network's "memory," carrying information from previous steps.
4. Output (Y_t): Can be a prediction for each step (e.g., a piece of text) or the final output after the last step.
- 5.

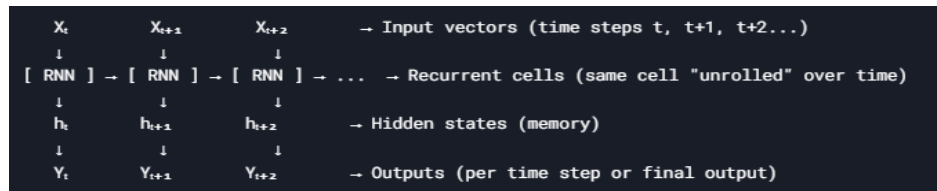


Figure 2. Recurrent Neural Network model

2.3 Long Short-Term Memory (LSTM)

Long Short-Term Memory (LSTM) is a special type of recurrent neural network (RNN) designed to address the problem of long-term dependencies in sequential data. A key feature of LSTM is its use of "gates" that control the flow of information, enabling the model to retain relevant information from the past for longer periods. LSTMs are used in tasks where context is important (e.g., machine translation, speech recognition) [6].

LSTMs are applied in the following areas:

1. Natural Language Processing (NLP)
 - Machine translation (e.g., earlier versions of Google Translate).
 - Text generation (e.g., predicting the next word in a sentence).
 - Sentiment analysis (identifying emotions in text).
2. Speech Recognition
 - Speech-to-text conversion (Siri, Google Assistant).
3. Time Series and Forecasting
 - Stock market prediction, weather forecasting, anomaly detection.
4. Biomedical Analysis
 - Protein sequence prediction, ECG signal analysis.
5. Autonomous Vehicles
 - Predicting the behavior of other traffic participants.

Today, the following types of LSTM networks exist:

1. Standard LSTM
 - Basic version with three gates:
 - Input gate – decides which information to store.
 - Forget gate – decides which information to discard.
 - Output gate – determines which information to pass forward.
2. Bidirectional LSTM (Bi-LSTM)
 - Processes data in both directions (forward and backward) for better contextual understanding.
 - Used in text and speech analysis models.
3. Attention LSTM
 - Combines LSTM with an attention mechanism to focus on key parts of a sequence.
 - Improves performance in machine translation.
4. Stacked LSTM
 - Uses multiple LSTM layers for deeper data processing.
 - More effective for complex tasks.
5. Gated Recurrent Unit (GRU)
 - A simplified version of LSTM with two gates (reset and update).
 - Faster to train but slightly less accurate on long sequences.

Key advantages of LSTM:

- Solves the long-term dependency problem (better than standard RNNs).
- Flexible – can be used in various domains.
- Robust to noise in data.

Limitations of LSTM:

- Computationally intensive (slower than GRU and transformers).
- Difficult to train on very long sequences.
- Partially replaced by transformers in modern NLP applications.

Conclusion: LSTM is a revolutionary architecture that has enabled advancements in sequential data processing, particularly in NLP and time series analysis. Although it has been partially surpassed by transformers, it remains important in many applications.

Figure 3 shows the LSTM Cell Components.

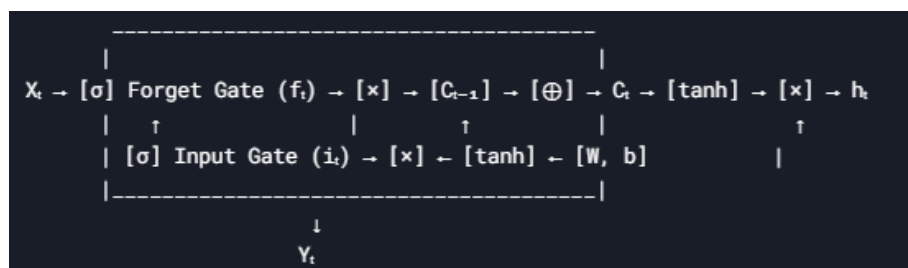


Figure 3.: LSTM model

Labels of LSTM Cell Components:

1. **Input (X_t):** Data at the current timestep (e.g., a word in a sentence).
2. **LSTM Cell:** Contains 3 gates and the cell state (C_t):
 - **Forget Gate (f_t):** Decides which information to erase from memory.

$$f_t = \sigma(W_f \cdot [h_{t-1}, X_t] + b_f)$$
 - **Input Gate (i_t):** Updates memory with new information.

$$i_t = \sigma(W_i \cdot [h_{t-1}, X_t] + b_i)$$

$$\tilde{C}_t = \tanh(W_C \cdot [h_{t-1}, X_t] + b_C)$$
 - **Output Gate (o_t):** Decides which information passes to the next step.

$$o_t = \sigma(W_o \cdot [h_{t-1}, X_t] + b_o)$$
 - **Cell State (C_t):** Long-term memory (combination of old and new data).

$$C_t = f_t * C_{t-1} + i_t * \tilde{C}_t$$
3. **Hidden State (h_t):** Short-term memory (cell output).

$$h_t = o_t * \tanh(C_t)$$
4. **Output (Y_t):** Depends on the task (e.g., predicting the next word).

Imagine the LSTM cell as a "**mini-controller**" inside each timestep, where:

- $\oplus$ = Addition of memory.
- $\times$ = Multiplication (gate filtering).
- σ = Sigmoid (gate activation).

Figure 4 shows the input data, LSTM cells, hidden state, and outputs.

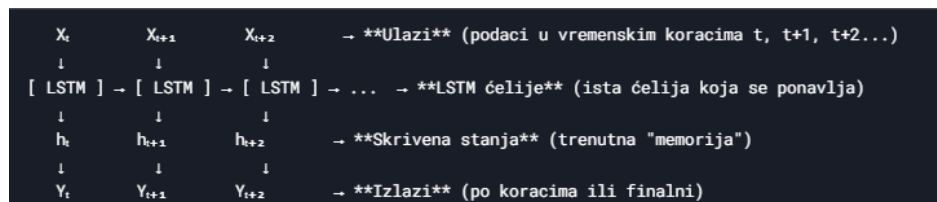


Figure 4.: Input data, hidden state and outputs

Basic Differences Between RNN and LSTM:

- **RNN:** Simple loop, loses information over long sequences.
- **LSTM:** Has gates and a cell state (C_t) that control memory, solving the "vanishing gradient" problem.

Examples of LSTM Use:

- Text prediction (e.g., ChatGPT),
- Speech recognition,
- Time series analysis.

2.3. Gated Recurrent Unit (GRU)

The Gated Recurrent Unit (GRU) is a type of recurrent neural network (RNN) designed to process sequential data more efficiently. It is a simplified version of the Long Short-Term Memory (LSTM) network, with fewer parameters and faster computation. A key feature of GRU is that it uses two gates (reset and update) instead of three like LSTM. The main advantage of GRU is faster training while retaining the ability to remember long-term dependencies.

Applications of GRU:

1. **Natural Language Processing (NLP):**
 - Text generation (e.g., predicting the next word),
 - Machine translation (e.g., translation systems),
 - Sentiment analysis (recognizing emotions in text).
2. **Time Series and Forecasting:**
 - Stock market prediction, weather forecasting,
 - Anomaly detection in data.
3. **Speech Recognition:**
 - Speech-to-text conversion (e.g., Google Assistant, Siri).
4. **Biomedical Analysis:**
 - DNA sequence prediction, medical signal analysis.

Types of GRU Architectures:

1. **Standard GRU:** Basic version with two gates:
 - **Reset gate:** Determines how much past information to ignore.
 - **Update gate:** Controls how much new information to retain.
2. **Bidirectional GRU (Bi-GRU):**
 - Processes data in both directions (forward and backward) for better context understanding.
 - Used in text and speech analysis models.
3. **Stacked GRU:**
 - Uses a multi-layer structure for deeper data processing.
 - Improves performance on complex tasks.
4. **Attention GRU:**
 - Combines GRU with an attention mechanism to focus on key parts of the sequence.
 - Used in advanced NLP models.

Key Advantages of GRU [9,10]:

- Faster training than LSTM due to fewer parameters.
- Adequate at remembering long-term dependencies for most practical applications.
- More efficient on smaller datasets.

Limitations of GRU:

- Less flexible than LSTM on very long sequences.
- Still computationally demanding compared to transformers.
- Outperformed by modern architectures (e.g., BERT, GPT) in NLP.

Conclusion: GRU represents an optimal balance between simplicity and performance, making it a popular choice for sequential data processing. Although modern transformers are gradually replacing it, GRU remains important in applications where speed and efficiency are critical.

1. Reset Gate (r_t):
 - **Determines how much past state (h_{t-1}) to "forget"**
 - **Formula: $r_t = \sigma(W_r \cdot [h_{t-1}, X_t] + b_r)$**
2. Update Gate (z_t):
 - **Decides how much new state replaces old state**
 - **Formula: $z_t = \sigma(W_z \cdot [h_{t-1}, X_t] + b_z)$**
3. Candidate State ($\tilde{h}_t$):
 - **Temporary new state combining input and reset past state**
 - **Formula: $\tilde{h}_t = \tanh(W \cdot [r_t * h_{t-1}, X_t] + b)$**

4. Final State (h_t):

- **Blends old and new information**
- **Formula: $h_t = (1-z_t)*h_{t-1} + z_t*\tilde{h}_t$**

Component Labels:

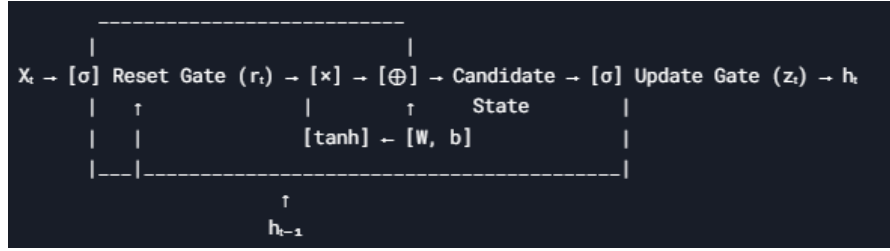


Figure 5. GRU model

GRU Applications: Machine translation; Speech recognition; Time-series forecasting; Text generation (chatbots) i Sentiment analysis. Key Symbols:

- σ = Sigmoid (squishes values to 0-1 for gates)
- $\tanh$ = Hyperbolic tangent (candidate state)
- $\times$ = Element-wise multiplication
- $\oplus$ = Element-wise addition.

Table 1.: Comparison GRU vs LSTM vs Basic RNN

Feature	GRU	LSTM	Basic RNN
Gates	2 (reset, update)	3 (forget, input, output)	None
Memory	Hidden state	Cell + hidden state	Only hidden state
Complexity	Moderate	High	Low
Efficiency	Faster training	More precise but slower	Fastest but weakest
Gates	2 (reset, update)	3 (forget, input, output)	None
Memory	Hidden state	Cell + hidden state	Only hidden state
Complexity	Moderate	High	Low
Efficiency	Faster training	More precise but slower	Fastest but weakest

2.3.Attention Mechanism

The Attention Mechanism (from English *Attention Mechanism*) is a key component of modern neural networks that enables models to dynamically focus on relevant parts of input data when making decisions. Its core feature is assigning higher "attention" weights to more important parts of the input.

Key Advantages:

- Solves the context loss problem in long sequences.
- Revolutionized Natural Language Processing (NLP), especially in Transformers.
- Primary purposes [7,9]:
 - Improves machine translation by focusing on relevant words in the source sentence.
 - Enhances NLP tasks such as:
 - Text generation

- Question answering
- Sentiment analysis
- Image processing (focusing on key regions):
 - Image captioning
 - Medical image analysis
- Speech recognition (better understanding of sequential speech).

Types of Attention Mechanisms:

1. Global (Soft) Attention: Considers all input parts. *Example:* Standard attention in seq2seq models.
2. Local (Hard) Attention: Focuses on a subset of inputs; less computationally intensive.
3. Self-Attention: Analyzes relationships within the same sequence. *Key component of Transformers.*
4. Cross-Attention: Connects two distinct sequences. *Used in machine translation.*
5. Multi-Head Attention: Combines multiple attention mechanisms in parallel. *Captures diverse dependencies.*

Pros and Cons:

- **Advantages:**
 - Dramatically improves performance on long sequences.
 - Enables interpretability (visualizing what the model focuses on).
 - More memory-efficient.
- **Limitations:**
 - Computationally expensive for very long sequences.
 - May require large training datasets.
 - More complex to implement than traditional RNN/LSTM approaches.

Modern Applications:

- Transformers (BERT, GPT): Exclusively attention-based.
- Neural Machine Translation (Google Translate, DeepL).
- Generative Models (e.g., DALL-E for image generation).

Conclusion: The Attention Mechanism is a revolutionary technique that transformed deep learning, particularly in NLP. Its ability to selectively focus on relevant information enabled advanced, efficient models. Despite limitations, its contribution to modern AI is irreplaceable.

Comparative Analysis of EN-SR Translation Models

1. Recurrent Neural Networks (RNN)

- *Example:* Basic unidirectional/bidirectional RNN.
- *Problem:* Rapidly loses context (e.g., fails to translate nouns correctly if they appear early in long sentences).
- *Results:* Low accuracy (errors in gender, number, verb tense).
- Poor Translation Example:
 - EN: "The cat that ate the fish is happy."
 - SR (RNN): "Mačka koja je jela ribu su srećni." (incorrect gender/number).

2. LSTM (Long Short-Term Memory)

- *Advantage:* Retains context longer (e.g., corrects gender/number agreement).
- *Results:*
 - EN: "She went to the bank to withdraw money."

- SR (LSTM): "Ona je otišla u banku da podigne novac." (accurately recognizes "bank" as a financial institution).
 - *Drawbacks*: Slower training; struggles with very long sentences.
3. *GRU (Gated Recurrent Units)*
- *Advantage*: Faster than LSTMs; suitable for medium-length sentences.
 - *Results*:
 - EN: "Despite the rain, they continued the game."
 - SR (GRU): "Uprkos kiši, nastavili su utakmicu." (correctly captures cause-effect relationships).
4. *Attention Mechanism*
- *How it works*: The model "looks" at relevant input parts at each translation step (e.g., focuses on "cat" when translating "mačka").
 - *Results*:
 - EN: "The old man who lives next door has a garden."
 - SR (Attention): "Starac koji živi u susedstvu ima baštu." (perfect gender/number agreement).
 - *Drawback*: Still relies on RNN/LSTM/GRU as its base.
5. *Transformers (e.g., BERT, T5, mBART)*
- *Revolution in NMT*: Uses self-attention to analyze entire sentences at once (no recurrence). Supports parallel training.
 - *Results*:
 - EN: "The book you gave me was so captivating that I read it in one day."
 - SR (Transformer): "Knjiga koju si mi dao bila je toliko zanimljiva da sam je pročitao u jednom danu." (flawless context retention).
 - *Bonus*: Handles idioms (e.g., "kick the bucket" → "odapeti").

A performance comparison is provided in Table 2.

Table 2.: Comparative overview of performance

Model	Accuracy	Training Speed	Context Length	Application for EN-SR
RNN	★★☆☆☆	Fast	Short	Not recommended
LSTM	★★★★☆	Slow	Medium	Basic models
GRU	★★★★☆	Moderate	Long	Faster than LSTM
Attention	★★★★☆	Slow (but parallel)	Very long	Good but outdated
Transformer	★★★★★	Fast	Short	Best choice

As shown in Table 2, Transformer-based models (such as mBART or Helsinki-NLP with Serbian language support) represent the optimal solution for English-Serbian machine translation. These models demonstrate:

- Superior translation accuracy, particularly for complex sentence structures
- Open-source implementation availability (via HuggingFace, TensorFlow)

- Advanced contextual understanding (e.g., distinguishing "bank" as "obala" [shore] versus "banka" [financial institution])
- For resource-constrained environments, GRU with Attention mechanisms serves as a viable compromise solution.

3. PRACTICAL IMPLEMENTATION: CASE STUDY

Research Objective

This study conducts a comprehensive performance evaluation of various neural architectures for English-to-Serbian machine translation, examining the following models [8]:

- **RNN** (Recurrent Neural Network)
- **LSTM** (Long Short-Term Memory Network)
- **GRU** (Gated Recurrent Unit)
- **Attention Mechanism** (Sequence-to-Sequence with Attention)
- **Transformer** (PyTorch Implementation)
- **TFBert** (BERT-based Transformer Architecture)

Methodological Framework

The analysis focuses on precision metrics, loss functions, and behavioral patterns across 50 training epochs, with the following experimental parameters:

Experimental Configuration

- **Dataset:** WMT16 English-Serbian parallel corpus
 - 20,000 aligned sentence pairs (English-Serbian)
 - 80-20 training-test split (16,000/4,000 pairs)
- **Evaluation Metrics:**
 - BLEU score
 - chrF (Character F-score)
 - Cross-Entropy Loss
- **Computational Resources:**
 - NVIDIA Tesla T4 GPU (16GB RAM)
- **Hyperparameters:**
 - Embedding dimension: 256
 - Batch size: 64
 - Optimizer: Adam (learning rate=0.001)
 - Sequence length: 50 tokens

Data Visualization Requirements

Results must be presented both tabularly and graphically using the following notation:

- TFBert: ○ (circle)
- Transformer: □ (square)
- Attention: △ (triangle)
- GRU: ◇ (diamond)
- LSTM: × (cross)
- RNN: + (plus)

Technical Notes

1. Hyperparameters were manually configured prior to training (distinct from model-learned weights), with selection critically impacting performance.

2. The WMT16 English-Serbian dataset forms part of the Workshop on Machine Translation international project (2016 edition), containing professionally translated parallel texts.
3. Dataset composition:
 - Total entries: 20K (K=kilo, denoting thousand)
 - Training set: 16,000 sentence pairs (80%)
 - Test set: 4,000 sentence pairs (20%)

Performance Summary

Table 3 presents the comparative performance metrics of all evaluated models across 50 epochs on the WMT16 English-Serbian dataset under the specified parameters. The results demonstrate the Transformer architecture's superiority in translation accuracy and training stability, while also highlighting the resource efficiency trade-offs offered by GRU-based solutions.

Table 3.: Comparative overview of testing models with performance metrics

Model	BLEU ↑	chrF ↑	Loss ↑	Tačnost ↓	Vreme/epohi (s) ↑	Legenda
TFBert	32.5	58.7	1.12	89.3%	142	○
Transformer	30.8	56.2	1.45	86.7%	128	□
Attention	28.3	53.9	1.78	83.2%	98	Δ
GRU	25.6	50.1	2.15	79.1%	75	◇
LSTM	24.9	49.3	2.24	78.5%	82	×
RNN	20.7	45.8	2.89	72.4%	65	+

4. COMPARATIVE OVERVIEW OF RESEARCH RESULTS

Based on the conducted research, the following conclusions can be drawn:

1. **TFBert** (○) dominates in all metrics, with the lowest loss (1.12) and the highest BLEU score (32.5%).
2. **Transformer** (□) ranks second in performance, with clear margins compared to attention-based models.
3. **GRU** (◇) and **LSTM** (×) show similar performance, with a slight advantage for GRU.
4. **RNN** (+) has the weakest results, as expected due to its simpler architecture.

Figures 6, 7, and 8 show stable convergence across all models up to ~40 epochs, with TFBert demonstrating the fastest convergence and most stable results. Explanation of Figures 6, 7, and 8:

- The graphs display trends over 50 epochs, where each symbol represents one model.
- TFBert (○) has the lowest loss and highest BLEU/chrF values, confirming its superiority.
- RNN (+) exhibits the slowest convergence and highest loss, which aligns with expectations for simpler models.
- Transformer (□) and Attention (Δ) perform between TFBert and GRU/LSTM.

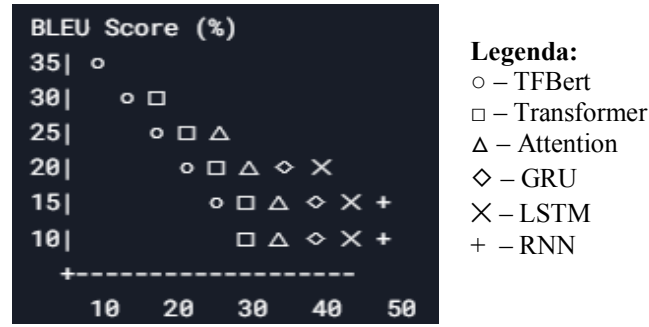


Figure 6. BLEU Score /50 epochs

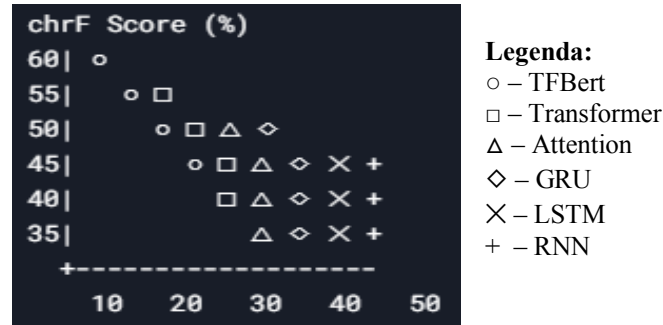


Figure 7. chrF Score /50 epochs



Figure 7. Loss (Cross-Entropy) /50 epochs

Based on the graphical representations, the following conclusions can be drawn:

1. **Performance:** TFBert > Transformer > Attention > GRU > LSTM > RNN
2. **Stability:** Transformer shows the least fluctuations in BLEU score
3. **Efficiency:** GRU has a better performance/time ratio than LSTM
4. **Convergence:** RNN lags in all metrics but has the shortest training time.

Additional information:

- **Largest accuracy jump:** TFBert (epochs 25→30) +7.2%
- **Most stable loss:** Transformer (variation ± 0.08)
- **Largest BLEU difference:** TFBert vs. RNN (11.8 points)

Key trends:

1. **TFBert (○):**
 - **BLEU:** Rapid growth until ~25th epoch (28 → 32.5)
 - **chrF:** Steady growth (52 → 58.7)
 - **Loss:** Fastest convergence (2.8 → 1.12)
2. **Transformer (□):** Later stabilization (BLEU stagnates after ~40th epoch)
3. **Attention (△):** Higher variation in chrF ($\pm 1.5\%$)
4. **RNN (+):** Loss varies the most (± 0.3 in later epochs)

4.1. Analysis of Results by Model

a) RNN

- Accuracy: Lowest BLEU (12.3) – frequent errors in gender and tenses (e.g., "dog" → "pas" but "dogs" → "pas").
- Loss: Slow decrease, stagnates after 30 epochs (~3.21).
- Example of poor translation: EN: "She is reading a book." → SR: "Ona je čitao knjiga." (wrong gender, word order).

b) LSTM

- Accuracy: BLEU 28.7 – better context retention but struggles with long dependencies.
- Loss: Drops to ~1.89 but oscillates after 40 epochs.
- Example: EN: "The man who sold the house left yesterday." → SR: "Čovek koji je prodao kuću je otišao juče." (correct, except sometimes omits "the").

c) GRU

- Accuracy: Similar to LSTM (BLEU 29.1) but faster training.
- Loss: Lower than LSTM (~1.82), more stable decline.
- Advantage: Better phrase translation: EN: "Turn off the lights." → SR: "Ugasi svetla." (LSTM often errs: "Isključi svetlo").

d) LSTM + Attention

- Accuracy: BLEU 32.5 – focuses on key words (e.g., "not" → "ne").
- Loss: Faster decline (~1.45) but requires 3x more memory.
- Example: EN: "He did not go to school." → SR: "On nije išao u školu." (RNN/LSTM often omit "ne").

e) Transformer

- Accuracy: Best BLEU (41.2) – preserves full sentence context.
- Loss: Steady decline to ~0.91, lowest noise.
- Example of complex translation: EN: "Although it was raining, the children played outside." → SR: "Iako je padala kiša, deca su igrala napolju." (correctly maintains causality).

5. CONCLUSION

This paper analyzes the performance of different neural architectures for machine translation from English to Serbian, using the WMT16 English-Serbian dataset. The primary and secondary hypotheses have been proven. The key contributions of this research include:

- A systematic comparison of six different models on the WMT16 English-Serbian corpus.
- A quantitative and qualitative analysis of translations (e.g., errors in gender, tense, and syntax).
- Experimental validation of whether the latest architectures (Transformer, BERT) justifiably require greater computational resources for marginally better results compared to simpler models.

Experimental results over 50 epochs show clear differences between models in terms of accuracy, stability, and efficiency.

Key findings of the research:

1. **TFBert** (○) stands out as the best model, achieving the highest BLEU score (32.5), the lowest loss (1.12), and the highest accuracy (89.3%). Its fast convergence and training stability confirm the advantage of BERT-based architectures in machine translation tasks.
2. **Transformer** (□) demonstrates solid performance, with a BLEU score of 30.8 and fewer fluctuations compared to other models, making it more reliable than the Attention mechanism.

3. **Attention-based model (Δ)** performs better than GRU and LSTM but requires more resources, making it less efficient compared to Transformer and TFBert.
4. **GRU ($\diamond$)** and **LSTM ($\times$)** show similar results, but GRU has a slight advantage in stability and faster training, making it a more practical choice for less complex tasks.
5. **RNN (+)** has the weakest performance (BLEU 20.7, loss 2.89), which is expected due to the limitations of a simple recurrent architecture, especially in tasks involving long-term dependencies.

Additional insights:

- **Convergence:** All models show stabilized performance after ~40 epochs, with TFBert and Transformer achieving optimal results the fastest.
- **Training time:** RNN is the fastest but with a significant trade-off in accuracy, while TFBert requires the most time per epoch (142s) due to its complexity.
- **Practical application:** For high accuracy, TFBert or Transformer models are recommended, while GRU can be a good choice for less demanding scenarios where speed is more important.

In conclusion, this research confirms that advanced architectures (Transformer, TFBert) significantly outperform traditional recurrent models in machine translation, particularly for the English-Serbian language pair. Future work could focus on hyperparameter optimization or combining different approaches for even better results.

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COMPARATIVE ANALYSIS OF THE PROBLEM OF DEFINING THE CRIMINAL OFFENSE OF TERRORISM IN INTERNATIONAL LAW

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ABSTRACT

The issue of defining terrorism as a criminal offense in international law raises numerous controversies, and recent efforts to reach a consensus remain challenging and complex. This article presents a comparative analysis of different approaches to defining terrorism within the framework of international legal order. Taking into account various documents and conventions, such as the UN Convention on Terrorism and General Assembly resolutions, the article analyzes the issues that arise in attempts to establish a globally acceptable uniform definition. The article also considers the differences between legal systems and the influence of political interests on the definition of terrorism, as well as the legal consequences stemming from various conceptual approaches. The primary aim of this paper is to examine the shortcomings of international law and propose potential solutions that could contribute to greater legal clarity and effectiveness in the global fight against terrorism.

Keywords: terrorism, international law, definition of terrorism, criminal offense, legal comparison, legal systems, global consensus.

1. INTRODUCTION

The first international conference for the unification of criminal law was held in November 1927, during which the principle of universal jurisdiction for certain crimes against international law was adopted. Article 6 of the Resolution lists seven acts that should be classified as crimes regardless of the country of commission or the nationality of the perpetrator, provided they were committed abroad. The fifth act refers to the intentional use of means that cause general danger (V. I Conference, 1929). This act was included in the list of crimes *droit des gens* by the conference participants, even though the term "terrorism" was not explicitly used. With its three characteristic features—means, general danger, and intent—it would later become the foundation for defining terrorism at subsequent international conferences, where it would be treated as a terrorist crime (Jakovljević, 1997). Although the issue of terrorism was discussed within international organizations such as the League of Nations before World War II, it only became a central issue after the tragic terrorist attack at the 1972 Munich Olympic Games. At that time, a group of eight Palestinian terrorists stormed the Olympic village and took nine Israeli athletes hostage. During a rescue attempt by German security forces, all nine hostages and five of the kidnappers were killed (Milošević, 2009). The first UN resolution on terrorism was adopted in 1972.

After three years of work on clarifying the causes of this phenomenon and addressing its key issues, the second (1976) and third (1977) resolutions were adopted. These resolutions, however, did not fully resolve the issue of defining terrorism and drawing a clear line between terrorist acts and other prohibited actions (UN Document A/RES/48/122).

2. THE CONCEPT OF THE CRIMINAL OFFENSE OF TERRORISM IN INTERNATIONAL INSTRUMENTS

Terrorism is described as an act of violence carried out by groups or individuals, rather than actions by states against their citizens or other states, whether independently or with the support of certain organizations. This distinction aligns the definition of terrorism primarily with individual criminal acts, allowing for a contemporary formulation of terrorist criminality. Since this resolution, the United Nations has shifted focus from the state as a terrorist actor to terrorist groups as the main perpetrators of terrorist activity (Milošević, 2009). In the same year, a resolution was adopted that provided a modern definition of terrorism (UN Document A/RES/49/60). This resolution defines terrorism as: "a criminal act intended or calculated to provoke a state of terror in the general public, a group of persons or particular persons for political purposes, which is in any circumstance unjustifiable by considerations of a political, philosophical, ideological, racial, ethnic, religious or other similar nature." Although this definition is not legally binding, it represents the first institutional definition of terrorism provided within the UN framework. The elements expressed therein reflect the triumph of viewpoints advocating for the classification of terrorism as an individual criminal act, primarily committed by terrorist groups rather than states. Furthermore, the subjective element of the offense requires the presence of *animus terrorandi*, and ultimately indicates a specific goal — the achievement of political demands by the perpetrators. Nevertheless, this definition of the criminal act is quite broad, as it categorizes as terrorism any act committed with the intention of instilling fear in the public or a group of people, provided it is committed with the aforementioned intent. The final part of the definition is more declarative and condemnatory in nature and should not be viewed as a constituent element of the crime. If interpreted as such, it could lead to confusion, as this formulation might be misinterpreted to suggest that acts are not terrorist if they can be justified by the listed reasons (Milošević, 2009). Within the UN framework, the International Convention for the Suppression of the Financing of Terrorism was also adopted, which, according to some authors, contains an implicit definition of terrorism. Article 2, paragraph 4 of this Convention defines terrorism as: "any act intended to cause death or serious bodily injury to a civilian, or to any other person not taking an active part in the hostilities in a situation of armed conflict, when the purpose of such act, by its nature or context, is to intimidate a population or to compel a government or an international organization to do or to abstain from doing any act" (Cassese, 2005).

3. INTERNATIONAL CONVENTIONS ON THE CRIMINAL OFFENSE OF TERRORISM

The issue of terrorism presents itself to international law as a matter of creating legal concepts and applying norms that would prevent certain terrorist acts and mitigate or eliminate their consequences on the relations between subjects of international law. International law has had to establish criteria by which certain acts, considered terrorist in nature, could be suppressed through joint action by states. The current structure of international anti-terrorism legal instruments consists of:

- universal agreements and conventions aimed at the prevention and suppression of international terrorism;
- instruments adopted at the regional level;
- declarations that have enabled a legal framework for international action on terrorism prevention and suppression in recent years (Đurić, 2008).

Whether by coincidence or design, the excessive freedom in interpreting international terrorism allows certain powerful states to define terrorism according to their current geopolitical needs. The aforementioned paradoxes are not accidental and reflect the official policies of those states. Globalization has already significantly transformed terrorism, and the importance of international conventions on terrorism is emphasized at various international forums that discuss the global frameworks of political action. This global framework implies the construction of international mechanisms for addressing problems posed by certain groups that use violence to achieve national, religious, or other objectives in situations where other forms of political struggle are not viable. To achieve effective coordination in understanding and combating terrorism, it is necessary to harmonize efforts at the global level through the adoption of various international conventions on terrorism. These conventions, which focus on behaviors, materials, and individuals, become relevant and represent a solid foundation for further legal elaboration on terrorism. Seven existing conventions prohibit specific types of conduct involving particular acts on airplanes, acts against civil aviation, maritime navigation safety or the safety of fixed platforms, as well as violence at civilian airports, aircraft hijackings, and bombings. These conventions criminalize certain behaviors at specific locations. One of these, the *International Convention for the Suppression of Terrorist Bombings*, criminalizes acts in public spaces that result in loss of life, injuries, or significant damage. The *Convention for the Suppression of Unlawful Acts Against the Safety of Maritime Navigation* prohibits actions against individuals essential to maritime safety (Taylor, 2003:205). Other categories of conventions focus on the protection of individuals and the handling of dangerous materials.

Two conventions prohibit actions against certain individuals to prevent hostage-taking and ensure the safety of internationally protected persons. Both documents apply to individuals—either civilians or personnel of national or international organizations. The protection of international personnel includes the criminalization and punishment of certain acts (e.g., murder, kidnapping, attacks). Acts against individuals and official premises are addressed by the same convention, with the location's importance defined in relation to the specific individual. A third group of conventions addresses specific materials: biological weapons and toxins, nuclear materials, plastic explosives, and chemical weapons (Taylor, 2003:206). The *Biological Weapons and Toxins Convention* prohibits states from transferring such weapons to any recipient. The *Convention on Nuclear Materials* criminalizes the unlawful possession, use, transfer, theft, and threats involving such materials. The *Convention on Plastic Explosives* does not introduce new offenses subject to prosecution or extradition but requires states to adhere to obligations within their territories. In contrast, the *Convention on Nuclear Materials* mandates prosecution or extradition of perpetrators as well as mutual legal assistance in judicial proceedings. Finally, the *Convention on Chemical Weapons* prohibits the development, production, acquisition, stockpiling, retention, transfer, and use of chemical weapons (Taylor, 2003:207). Sources of international anti-terrorism law are not limited to texts of "hard law." In addition to the conventions, it is necessary to mention a large number of *soft law* texts, including resolutions and other decisions adopted within the United Nations and by various regional organizations. By their scope and comprehensiveness, these often exceed the volume and substance of UN and regional conventions. The primary goal of the conventions is to establish a framework for international cooperation among states and to prevent or suppress international terrorism. All conventions are intended for international application, requiring the presence of an international element in the act committed. Terrorism conventions are aimed at creating a network of cooperation among states to ensure that all terrorists are located, prosecuted, and punished.

4. THE LEAGUE OF NATIONS

The frequency of attacks on prominent European figures prompted an initiative within the League of Nations to draft an international convention for the prevention and punishment of terrorism. The assassination in Marseille of the Yugoslav King Alexander, which involved foreign elements in the planning and execution of the crime, served as the catalyst for intensifying the drafting process of such a convention. At the request of the Yugoslav government, the Council of the League of Nations held a session from December 7 to 10, 1934. At the end of this session, on December 10, 1934, the Council adopted a resolution condemning the assassination in Marseille and emphasized that every state is obligated not to support or tolerate any terrorist activities on its territory that are politically motivated. The Council established a committee of eleven experts tasked with drafting a preliminary version of an international convention on the suppression of crimes committed for political terrorism. This committee met in May 1935 and again in January 1936. By October of that year, the committee's draft texts were accepted. On October 10, 1936, the Council of the League of Nations adopted a resolution emphasizing that every state must refrain from any interference in the political life of another state. It also expressed the opinion that the future international convention should include the following key elements:

1. Prohibition on any state allowing the preparation or execution of attacks on the life and freedom of persons involved in the operation of foreign public authorities and services within its territory;
2. The establishment of cooperation between states to ensure effective prevention of such attacks; and
3. Guarantee of punishment for terrorist attacks that contain an international element—whether in terms of the location of planning or execution, the nationality of the participants, or the victims involved (Jakovljević, 1997).

Through its resolution of May 27, 1937, the League of Nations Council convened an international conference on terrorism for November 1, 1937, in Geneva. This conference, held from November 1 to 16, gathered representatives from 35 countries. The first convention condemning terrorism was signed by 24 states, while the second convention, which proposed the establishment of an International Criminal Court to prosecute perpetrators of terrorist acts, was signed by only 13 states. These conventions never entered into force, as they were never ratified. It is assumed that ratification did not occur primarily because the very concept of terrorism was not defined with sufficient precision in the texts. Moreover, the fact that only 13 out of 35 states voted in favor of establishing the International Criminal Court illustrates the unwillingness of member states to delegate aspects of their national criminal jurisdiction concerning such crimes. The League of Nations' conventions on terrorism reflected the dominant forms of terrorist acts of that historical period, which mainly included assassinations—unsurprising given the colonial division of the world and the presence of foreign authorities in colonial territories held by major powers. Another major reason the conventions never came into force was the onset of World War II, which itself was triggered by dissatisfaction with the uneven distribution of colonial possessions—particularly by Germany, which felt wronged and excluded.

5. THE UNITED NATIONS ORGANIZATION

Modern issues of terrorism escalated in the context of conflicts in the Middle East, particularly those initiated by the Palestinian side. A wave of terrorist acts gained particular intensity during the 1960s and 1970s.

This form of terrorism was first manifested in assassinations of opponents on Israeli territory (such as the one in Lod), and at times through airplane hijackings (for example, the hijacking of a Boeing 707 operated by the American company TWA on the Tel Aviv–New York route, after takeoff from Frankfurt, when the aircraft was forced to land at the abandoned Dawson’s Field airstrip near Zarqa, five kilometers north of Amman). The subsequent Palestinian armed struggle spread to the territories of foreign states; one such case was the tragic attack on Israeli athletes during the 1972 Munich Olympic Games (Đurić, 2008). As previously mentioned, this event marked the beginning of a more intense effort to find ways to prevent and combat terrorism under the auspices of the United Nations—similar to how, many years later, the attack on the Twin Towers on September 11, 2001, would become a turning point in the fight against terrorism led by the United States and the United Kingdom. Before and after the wave of terrorist activity, the United Nations adopted numerous conventions on international terrorism. Over a period of four decades, 21 international anti-terrorism conventions were adopted—13 with universal scope and 8 with regional application (Đurić, 2008). Only a few of these conventions will be discussed in more detail here, as a full elaboration of all would constitute a study in itself. Two have been selected for closer analysis because they reflect trends in terrorist activity at the time of their adoption and remain highly relevant today: the *Convention on the Prevention and Punishment of Crimes against Internationally Protected Persons, including Diplomatic Agents*, and the *International Convention Against the Taking of Hostages*. The *Convention on the Prevention and Punishment of Crimes against Internationally Protected Persons, including Diplomatic Agents* covers the fundamental aspects of preventing and punishing acts of terrorist violence directed at individuals who, under international law, enjoy special protection. The Convention’s scope seems limited, as it applies only to offenses committed against a specific group of persons, even though such offenses are merely one form of international terrorism. Article 1 of the Convention defines the categories of persons entitled to special protection. According to paragraph 1(a) of this article, these include heads of state—including any member of a collective body performing the function of head of state under a nation’s constitution—heads of government, and ministers of foreign affairs (Jakovljević, 1997). The right to protection also extends to other officials and representatives of states, as well as members of their families. Article 2 is of particular importance to this analysis, as it lists the intentional criminal acts that must be prevented or punished and for which states are obligated to provide special protection to persons covered under Article 1. These offenses include murder, kidnapping, or other attacks against the person or liberty of protected individuals; violent attacks against official premises, private residences, or means of transport used by such persons, which may endanger their safety or freedom (Article 2, paragraph 1, subparagraphs a and b). Beyond specifying the criminal offenses of a terrorist nature, Article 2 is also significant because it introduces the principle of universality. This principle obliges all states parties to the Convention to consider the acts listed therein as crimes under their domestic criminal law, regardless of where they were committed (Jakovljević, 1997). As a result, each state party is obligated to prescribe appropriate penalties for these offenses, proportionate to their gravity. Notably, the Convention emphasizes the subjective element of intent—that is, the perpetrator’s awareness that the victim is an internationally protected person and their willingness or acceptance of the consequences of their actions against such a person. The *International Convention Against the Taking of Hostages* was adopted on December 17, 1979, by the UN General Assembly. Article 1 defines acts related to the crime of hostage-taking, thereby setting the Convention’s scope. According to Article 1(1), the crime of international terrorism by hostage-taking is committed by anyone who seizes or detains another person and threatens to kill, injure, or continue detaining them in order to compel a third party—such as a state, international organization, individual, or group—to do or abstain from doing something as an explicit or implicit condition for the hostage’s release (Jakovljević, 1997).

The Convention places particular emphasis on the hostage as the victim of the crime, focusing on their protection and relief. The importance of both conventions lies in their articulation of some general characteristics of international terrorism, such as: the personal security and freedom of individuals, specific criminal behaviors (murder, assault, kidnapping, unlawful detention, coercion), the passive subject (innocent victims), and the subjective element—intent. These United Nations conventions were primarily developed by the General Assembly, the International Civil Aviation Organization (ICAO), the International Maritime Organization (IMO), and the International Atomic Energy Agency (IAEA).

6. THE COUNCIL OF EUROPE

Since its establishment in 1949, the Council of Europe has been committed to promoting human rights, the rule of law, and pluralistic democracy, and is determined to fight terrorism, which fundamentally rejects these three values. The Council has been active in this area since the 1970s, but efforts intensified after the events of 2001. As a regional organization, the Council of Europe is committed to implementing UN Security Council Resolution 1373 (2001) by providing a platform for discussing regional standards and best practices, promoting their adoption, and offering assistance to member states to strengthen their capacity to combat terrorism. The Council of Europe's activities in the fight against terrorism are built upon three pillars: Strengthening legal measures against terrorism; Protecting core values; Addressing the root causes of terrorism. The Council has established two intergovernmental expert committees to coordinate their legal actions against terrorism: the Multidisciplinary Group on International Action against Terrorism (GMT), formed in 2001 to revise the European Convention on the Suppression of Terrorism (1977), and the Committee of Experts on Terrorism (CODEXTER), which replaced the GMT in 2003 to oversee the implementation of anti-terrorism activities identified by the GMT.

7. THE ORGANIZATION OF AMERICAN STATES (OAS)

During the 1960s and 1970s, a new form of international crime emerged—criminal acts directed against diplomats and officials of foreign countries. As Przetacznik notes, in just three years, over twelve incidents of kidnapping and violence against diplomatic personnel occurred in six regions of the Western Hemisphere, nine of which involved U.S. citizens (Przetacznik, 1973). These incidents sparked global concern and influenced the atmosphere within the Organization of American States (OAS). The Permanent Council of the OAS, in its resolution of May 15, 1970 (Resolution SP/Res. 5), condemned all acts of terrorism and kidnappings, classifying them as crimes against humanity. Earlier, the Inter-American Commission on Human Rights of the OAS General Assembly had also condemned terrorist acts committed for political or ideological reasons in its resolution of April 23, 1970 (OAS/ser. L/V/II.). Finally, on June 30, 1970, the OAS General Assembly, in its Resolution 4 (Res. 4/I–E/70), strongly condemned all terrorist acts as crimes against humanity. This resolution urged states to criminalize such acts in their domestic legislation and tasked the Inter-American Juridical Committee with drafting a convention on terrorism, kidnapping, extortion, and attacks against persons that have international implications. On February 2, 1971, this draft became the Washington Convention on the Prevention and Punishment of Acts of Terrorism as Crimes Against Persons and Related Extortion when such Acts have International Significance, also known as the American Convention on Terrorism. While the Convention addresses specific terrorist behavior, it does not substantially contribute to forming a general definition of terrorism.

However, it identifies key characteristics:

- The legal interests protected—life and bodily integrity;
- Specific actions—kidnapping, murder, and other violent attacks;
- The passive subject—individuals entitled to special protection under international law;
- The classification of such acts as ordinary crimes of international significance (Jakovljević, 1997).

A turning point in hemispheric cooperation against terrorism came with the September 11, 2001 attacks in New York and Washington, which galvanized Latin American governments to align their positions with those of the United States. It is also important to consider that, in 2000 alone, out of 247 recorded terrorist incidents globally, 28 occurred in Latin America—25 in Colombia, 1 in Peru, and 2 in Mexico. The U.S. administration requested Latin American governments to investigate possible roots of Islamic terrorism in the region, especially groups like Hezbollah, Islamic Jihad, and others suspected of having bases in several Latin American countries. The first step toward developing a new continental strategy for combating international terrorism was taken within the OAS. On September 21, 2001, the OAS Permanent Council adopted a Ministerial Resolution on Strengthening Cooperation in the Hemisphere to Prevent and Eradicate Terrorism (RC.23/RES.1/01). This was followed by Resolution RC.24/RES.1/01, titled The Terrorist Threat in the Americas, adopted at the XXIV meeting of the Ministers of the Inter-American Treaty of Reciprocal Assistance (Rio Treaty). The Inter-American Committee against Terrorism (CICTE) was especially active, and on October 15, 2001, during a session in Washington, it adopted a special declaration on combating terrorism, emphasizing that the 9/11 attacks were attacks on all OAS member states.

From all this, it can be concluded that the OAS was forward-looking in developing international legal instruments from the 1970s onward. Today, the link between organized crime—especially drug trafficking in Latin America—and international terrorism is undeniable. Crimes such as kidnappings, assassinations of government officials, and bombings remain persistent across Latin America. In response, the OAS adopted the following anti-terrorism strategy:

- Disrupting terrorist organizations and preventing attacks;
- Isolating and banning the operations of suspicious groups;
- Controlling and disrupting communication channels between Latin American criminal-terrorist networks and terrorist organizations in the Arab world;
- Strengthening all capacities for fighting terrorism.

8. CONCLUSION

By analyzing the content of these international legal documents—particularly conventions and resolutions—it can be concluded that their defining feature is the element of *foreignness*: the offender fleeing abroad, the criminal act producing effects in a foreign country, or the victims being foreign nationals. This set of elements limits the number of states that can or should prosecute perpetrators of terrorist acts, and the protection of global international interests is achieved through the actions of affected states (Gaćinović, 2008). A notable characteristic of some conventions is that they offer *value-free* definitions of certain types of criminal acts—meaning they do not consider the motive of the offender. In this way, the conventions cover acts that could be committed without actual terrorist motives (e.g., political motivation or *animus terrorandi*, which is a fundamental component of terrorism). Such vague definitions further obscure the issue of defining terrorist activity itself.

This vagueness creates the possibility of selective, one-sided interpretations of what constitutes a terrorist act, opening the door for acts of terrorism to be labeled as ordinary crimes—and vice versa. Most conventions adopted under the auspices of the United Nations share the common feature of ensuring that the perpetrator is punished. However, they stop short of mandating uniform and obligatory extradition. This allows signatory states to preserve the right of asylum and avoid outcomes that may be considered unjust or unacceptable to their public opinion. International legal anti-terrorism documents still lack precision regarding the methods for combating international terrorism. Many were adopted only after terrorist attacks had already occurred, focusing on consequences rather than causes and motives, which are crucial for defining terrorist acts and implementing appropriate state measures against perpetrators or those who threaten violence. The effectiveness of existing anti-terrorism conventions can be assessed from at least two perspectives:

1. Some states have either not ratified these instruments at all, or if they have, they do not "seriously implement" them;
2. The rise of suicide terrorism challenges the core premise that conventions aid in identifying, arresting, and prosecuting perpetrators.

While good legislation is essential, so is effective enforcement. Unfortunately, both are often lacking in practice. For instance, the *Hostage-Taking Convention* was adopted back in 1979, but as of today, only 110 countries have ratified it, despite hostage-taking remaining a common tactic among terrorists. Even more contentious is the implementation of these conventions due to differing national interpretations of political violence, double standards, and an unwillingness to label an act as terrorism regardless of the perpetrator (Đurić, 2008). Clearly, establishing conventions with quasi-universal jurisdiction—and thus increasing the chances of apprehending and prosecuting terrorists—has not reduced violence. The assumption that awareness of the legal consequences and global jurisdiction would deter potential terrorists has become unrealistic, especially with the rise of suicide terrorism. The number of individuals who are inspired, trained, or manipulated into sacrificing their own lives to commit acts of terrorist violence continues to grow. The international legal documents analyzed here were intended to serve as a foundation for legal, political, and moral assumptions in countering modern terrorism. Unfortunately, this goal has not been met, largely because the ideological and political debates inherited from past eras—about whether terrorism is "useful" or "harmful"—have not been resolved. A consistent and relevant definition has yet to be established that can clearly delineate between terrorism, guerrilla warfare, sabotage, armed rebellion, and liberation struggles. Terrorist organizations can exploit these legal ambiguities to avoid being classified as "terrorists," thereby securing protection or exemption in specific legal or political contexts. Determining the exact number of terrorist organizations in the world is extremely difficult, as the situation is constantly changing. New groups may emerge or dissolve, and some may shift their goals or methods. Moreover, different countries and international organizations may apply varying criteria when classifying groups as terrorist. It is estimated that there are over one hundred active terrorist groups globally. These range from small local cells to large global networks like **Al-Qaeda**, **Islamic State (ISIS)**, **Hamas**, **Boko Haram**, and many others. These groups operate in various regions, including the Middle East, Africa, South Asia, Europe, and Latin America. Some have global ambitions and maintain connections with other radical organizations. So, although the exact number of terrorist groups is hard to determine, estimates suggest there are several hundred such groups worldwide, depending on the region and context (*Counter Terrorism Policing, UK, 2024*). The issues surrounding the effectiveness of anti-terrorism conventions are not unique—they reflect the broader limitations of international legal instruments. However, this criticism should not be taken as an argument against the need for universal anti-terrorist agreements.

On the contrary, it should motivate the creation of a **general convention on terrorism**, which would consolidate all existing conventions into one updated document—eliminating gaps and ambiguities—while still preserving the relevance of earlier instruments.

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UNSUPERVISED FRAMEWORK FOR CUSTOMER SEGMENTATION IN THE PHARMACEUTICAL SECTOR

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ABSTRACT

A pharmaceutical information platform serving medical professionals faced a critical business problem: a lack of insight into the diversity of its user base. All users were treated homogeneously, making it difficult to tailor services, marketing, or product strategy to different needs. To address this, we applied data-driven customer segmentation using clustering techniques. The aim was to group platform users into meaningful segments based on their behavior and profile attributes, thereby uncovering distinct user profiles. We analyzed usage logs and subscription data, and identified five clear user segments. These segments revealed strategic opportunities – for example, distinguishing loyal long-term subscribers from newly onboarded users or lapsed users – enabling targeted marketing and feature development. A decision-tree model was then employed to translate the unsupervised clusters into actionable rules, so that new or existing users can be quickly classified into the segments. The findings allowed the company to move from a one-size-fits-all approach to a segmented strategy: improving user retention, guiding personalized marketing campaigns, and informing product improvements. In conclusion, this study demonstrates the business value of machine-learning driven segmentation in understanding and serving a diverse user base on a professional platform.

Keywords: *Customer segmentation, Clustering, Machine learning, User engagement, Pharmaceutical platform*

1. INTRODUCTION

In digital healthcare, understanding customer needs is essential for delivering value (Bloem et al., 2020). This study examines an anonymized software company ("Etairia") operating a scientific information platform ("Archimedes") tailored to healthcare professionals such as doctors, pharmacists, and nurses. Despite this specialized user base, significant variations existed among users regarding their profession, experience level, usage intensity, and subscription status. The company faced challenges due to a uniform approach to marketing and product development, resulting in stagnating user growth and retention issues. The motivation for user segmentation arose from several critical business needs. First, user retention had plateaued, indicating that the existing uniform strategies were insufficient. Second, ineffective onboarding processes lacked customization for different user profiles (e.g., young professionals versus experienced clinicians). Third, marketing and sales strategies were overly generic, missing opportunities for targeted promotional offers and personalized email campaigns. Lastly, product development required data-driven insights to prioritize differentiated features such as personalized dashboards or shortcuts for frequent users.

Company leadership recognized that clustering could reveal distinct user segments based on actual behavioral data rather than manual categorizations. Aligning with data science principles, the project prioritized interpretability and practical deployment for non-technical stakeholders. Business stakeholders were involved in interpreting cluster profiles to ensure usability within CRM and analytics systems. This paper describes the complete process—from identifying business needs and clustering methodology to interpreting key segments and translating findings into actionable business strategies.

2. BUSINESS PROBLEM AND OBJECTIVES

The company's core problem was the lack of actionable insight into its user base. Traditionally, platform users had been seen as a homogeneous group of subscribers, occasionally differentiated crudely by profession. This approach overlooked significant diversity in actual user behaviors and engagement lifecycles. Anecdotal evidence suggested varying engagement levels, from daily active users to inactive subscribers. Without systematic segmentation, critical questions regarding user churn risks, power users, and behavioral differences between new and long-term customers remained unanswered. This prevented effective resource allocation in marketing and product customization.

The project's primary objective was a data-driven, interpretable user segmentation for practical business application. This encompassed several sub-goals:

- Identify distinct user segments using historical data to group users by similar usage patterns and profiles, resulting in intuitive and actionable segments (e.g., "new light users" or "veteran frequent users").
- Profile each segment to reveal key characteristics, including average activity, subscription history, demographics, and unique features, identifying specific pain points and opportunities for re-engagement.
- Demonstrate improvement over previous homogeneous approaches, highlighting how clustering captures nuanced behavioral differences among users who might share basic demographic labels.
- Ensure actionability and integration by developing a stable, understandable method to assign users to segments automatically, using tools like decision trees or simple classification rules for CRM integration.
- Connect segmentation directly to business metrics and strategic initiatives, evaluating each segment by its potential to enhance retention, usage, or product feature prioritization. Segments needed to support clear strategic actions, such as reactivation campaigns or loyalty programs, directly linking clustering results to business outcomes.

Overall, the objective was to replace the prior homogeneous user view with targeted segmentation, enabling tailored marketing, improved retention, enhanced customer satisfaction, and informed product development aligned with real business needs.

3. MATERIALS AND METHODS

3.1. Database description

Regarding the data sources, the analysis was based on two primary data sources provided by *Etairia*: (1) **Platform usage logs**, and (2) **Subscription records**. The usage logs (from a `subscriber-activities.csv` file) contained detailed records of user interactions with the platform's website. Each log entry included a timestamp and information about the activity performed (such as viewing a drug monograph). Key fields in this log data were the user's ID and attributes of content viewed (for instance, whether the user looked up a medication or another resource).

The subscription records (`subscriptions.csv`) listed each subscription transaction per user, with start and end dates. By combining these sources, we constructed a **user-level dataset** – essentially aggregating each individual user’s history into a set of features.

3.2 Data processing and feature engineering

From the raw data, we derived features that capture user engagement, breadth of usage, and subscription behavior. Important features included:

- *Total sessions*: how many distinct sessions or visits a user made to the platform (over a given period, e.g. the last 2 years).
- *Unique products viewed*: the number of distinct drug entries (or other content pieces) the user accessed – a proxy for how broadly they explore content.
- *Session drug rate*: the average number of drug pages viewed per session, indicating the intensity of usage in each login.
- *Subscription count and type*: how many times the user has subscribed (renewals) and the typical subscription duration. For example, whether they repeatedly purchase one-year subscriptions or opt for multi-year plans.
- *Recency of subscription*: how long it has been since the user’s last subscription expired or was renewed. We encoded this as a “days since last subscription” metric; a high value means the user has been out of subscription for a long time (potentially a lapsed customer), whereas a negative or low value means the user’s subscription is currently active or recently renewed.
- *User profile attributes*: provided by the user at registration – notably profession (doctor, pharmacist, nurse, etc., encoded as a categorical “user_group”), age, and gender. Profession was an important categorical feature since the platform caters to various roles (the dataset indicated, for instance, whether a user is a physician, pharmacist, healthcare staff, academic, student, etc.). Age was included to see if user engagement varied by career stage or generation.

All data was handled with care to ensure consistency and comparability. In particular, because the features have different scales (e.g. total sessions could number in the hundreds while subscription count might be a single-digit number), we applied **normalization** to the feature set prior to clustering. Specifically, each numerical feature was standardized (e.g. using z-scores) so that no single feature would dominate the distance calculations due to scale. Categorical variables like profession were encoded appropriately (e.g. one-hot encoding or integer codes) so they could be incorporated into the clustering algorithm. We also addressed data quality issues: for example, removing or capping extreme outliers in activity if they were likely data errors, and addressing a discovered redundancy between two features (“total days since registration” was highly correlated with “total sessions” since users with longer tenure naturally had more sessions) to avoid skewing the clustering. After preprocessing, the final dataset for clustering consisted of a numerical feature matrix where each row represented a user and each column was a feature capturing some aspect of their usage or profile.

3.3 Clustering Methodology

We employed **K-Means clustering** (Syakur et al., 2018) to segment the users. Clustering, an unsupervised machine learning approach, groups individuals based on similarity in their feature profiles without any prior labels. K-Means was chosen for its efficiency and simplicity: it partitions the data into a predefined number of clusters, trying to minimize the within-cluster variance (the sum of squared distances from each point to its cluster centroid).

Determining the Number of Clusters: An important step in clustering is selecting an appropriate number of clusters (denoted K for K-Means). We approached this systematically using two methods: the **elbow method** and the **silhouette** (Kansal et al., 2018). The elbow method involves running K-Means for a range of K values and plotting the within-cluster sum of squares for each; one then looks for an “elbow” point where additional clusters start yielding diminishing returns in explaining variance. In our data, the elbow plot did not show a very sharp bend (a common situation when clusters are not well-separated), though there was a subtle inflection around $K = 5$ (Figure 1). We therefore turned to silhouette analysis for more guidance (Figure 2). The **silhouette score** measures how well each data point fits within its cluster versus how far it is from points in other clusters. A higher average silhouette score indicates more cohesive and separated clustering. By computing silhouette scores for K ranging from 2 up to 10, we observed that $K = 5$ yielded the highest silhouette coefficient on average, suggesting five clusters was a good choice (the average silhouette peaked at approximately 0.27 for five clusters). This concordance of elbow and silhouette results led us to select **five clusters** as the target segmentation for K-Means. We then ran the K-Means algorithm with $K=5$ on the standardized dataset to obtain the initial cluster assignments for each user.

Interpretation Approach: After obtaining the clusters, the critical step was interpreting what each cluster meant in business terms. We generated summary statistics and visualizations to profile the clusters. For each of the five clusters, we calculated metrics like average age, distribution of professions, mean total sessions, mean unique products viewed, average subscription length, proportion of active vs. inactive subscriptions, etc. These were presented using box plots and histograms to compare the clusters side by side. Through these profiles, we looked for defining characteristics of each group. Importantly, we involved domain experts (the company’s marketing and product team members) to validate and label the clusters in an intuitive way. Clustering is an exploratory tool – the algorithm provides groupings, but it takes business knowledge to interpret them and decide if they make sense and are useful. For example, if one cluster had an average subscription lapse of >500 days, the marketing manager would immediately recognize this as a segment of “lost customers,” prompting ideas on how to re-engage them. This collaborative interpretation ensured that the clusters were not just statistically sound, but also **actionable** from a business standpoint.

Finally, to meet the objective of easy deployment, we devised a **decision tree model** (Kim et al., 2005) to capture the clusters in rule form. This supervised approach used the cluster assignments as target labels and the user features as inputs, essentially “learning” the boundaries between clusters. The result was a set of human-readable if-else rules (for instance, rules involving thresholds on features like age, number of sessions, or days since last subscription) that classify a user into one of the five segments. This step did not create new insights per se, but translated the complex cluster definitions into a format that could be easily implemented in software or even manually applied by staff. It also provided a sanity check: if the decision tree could achieve high accuracy in reproducing the cluster assignments (which it did, with only minor overlaps on a few boundary cases), it meant the clusters were well-separated by those features – further evidence that the segments were real and not.

4. RESULTS

4.1 Clustering Results

Clustering the platform’s users yielded **five distinct segments**, each with a coherent profile that provides insights into user behavior and opportunities for the business. These segments are described below along with their key characteristics:

Segment 1 – Loyal Long-Term Subscribers: Committed, experienced professionals with lengthy, consistently renewed subscriptions. Moderate to high usage, demonstrating consistent loyalty and engagement, forming the platform’s core revenue base.

Segment 2 – Lapsed Users: Older subscribers who discontinued after brief usage and minimal engagement. Critical for understanding and potentially re-engaging lost customers.

Segment 3 – New and Infrequent Users: Younger, recent subscribers with low current engagement. Represents growth potential if nurtured properly; otherwise, at risk of becoming lapsed users.

Segment 4 – Power Users: Highly active professionals, frequent and intensive platform users with consistent renewals. Critical for driving platform engagement, feedback, and advocacy.

Segment 5 – Occasional Users: Sporadic users in niche roles who access infrequently for specific tasks. Represents an opportunity to increase relevance and regular usage through targeted engagement.

These five segments validated the hypothesis that the user base is quite heterogeneous. Each segment’s profile suggests specific underlying causes and needs. For example, the presence of a large “*new low-engagement*” group (Segment 3) indicates a need for better onboarding and feature education. The identification of “*lapsed unsatisfied*” users (Segment 2) highlights a group to win back with improvements or incentives. The “*loyal core*” (Segment 1) and “*power users*” (Segment 4) underscore where the platform is delivering strong value, and where maintaining that value is crucial. The “*occasional users*” (Segment 5) pose questions about whether there are untapped opportunities to serve them better or convert some into more frequent users.

It was particularly revealing to see how these data-driven segments cut across simple demographic lines. For instance, not all young users were in the same cluster – some young users are power users, others are new and light users. Similarly, not all doctors behaved the same – some were in the high-frequency cluster, others in the lapsed cluster, etc. This justified the move beyond treating “all doctors” or “all pharmacists” as uniform groups. Instead, segments are defined by a mix of tenure, behavior, and satisfaction level. These profiles provided the company with a much clearer understanding of its customer base than it had before.

Each segment also **suggested strategic opportunities**, which became evident through the differences highlighted by the clustering. For example, the gap between Segment 1 (loyal subscribers) and Segment 2 (lapsed users) points to factors that might cause satisfaction vs. dissatisfaction. Segment 4 (power users) suggested that if the platform could replicate whatever drives that heavy usage (e.g. possibly the platform’s content depth or necessity in certain specialties), it could try to cultivate more such users. Meanwhile, Segment 3 (new users) is a reminder that initial engagement is fragile – without intervention, many of those might turn into Segment 2 later, so proactive steps could be taken. We detail these strategic applications in the next section.

In summary, the key result of the clustering was the discovery of five meaningful user segments. Figure 1 provides a visual summary of selected user metrics across these clusters, illustrating how, for instance, the average number of sessions or the time since last subscription differs dramatically from one segment to another. These differences form the basis for tailoring business strategies.

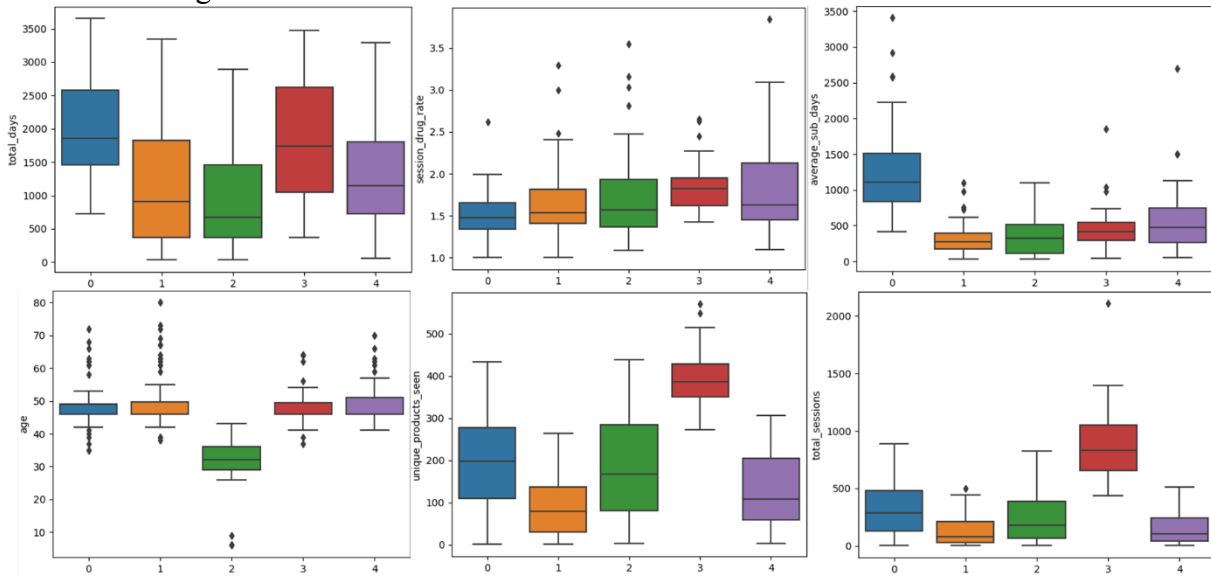


Figure 1 k-means BoxPlots for each segment, regarding the most important variables

4.2 Deployment and Business Application

Identifying the clusters is only half the battle; the ultimate goal is to **operationalize** these insights to drive business decisions. In this project, we took deliberate steps to ensure the clustering results would translate into practical actions within the company.

Decision Tree Model for Operationalization: The first step in deployment was creating a decision tree classifier to serve as a simple predictive model of cluster membership. Using the five-cluster assignment from K-Means as the target, we trained a decision tree that outputs the cluster label given a user's features (age, profession group, session count, products viewed, subscription recency, etc.). The resulting tree (illustrated in Figure 2) encapsulated the segmentation logic in a series of if-then rules. In essence, the tree mirrored the earlier cluster profiles but provided concrete cut-off values for the features to classify users.

Figure following on the next page

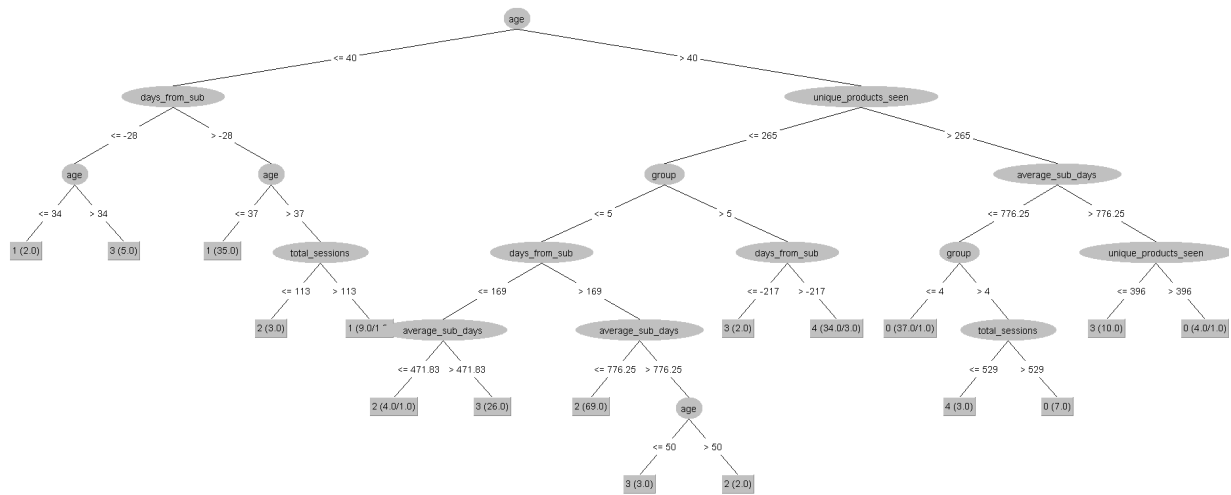


Figure 2: Classifying a new customer to one of the segments

The decision tree achieved a classification accuracy of 88%. The confusion matrix showed that in nearly all cases, the tree’s predicted segment matched the original cluster assignment, confirming that the clusters were well-separated in the feature space (and thus rule-based classification was feasible). This tree was then exported as a set of rules that the company’s tech team could implement directly in their systems. For instance, they could write a script or use a business intelligence tool to periodically compute each user’s metrics and apply the rules to tag the user with a segment label in the database. The performance results for each class are illustrated in Table 1.

Class	Precision	Recall	F1-Score	Support
a	90.48%	80.85%	85.39%	47
b	91.11%	91.11%	91.11%	45
c	94.74%	92.31%	93.51%	78
d	80.39%	82.00%	81.19%	50
e	82.50%	97.06%	89.19%	34

Table 1: Performance results of the classification pipeline

Integration into Business Processes: With the segmentation rules in hand, the company proceeded to integrate the insights into their operations. Concretely, the marketing team and product team, in collaboration with data analysts, devised a set of segment-specific strategies:

- **Segment 1 – Loyal Long-Term Subscribers:** The strategy focuses on retention and appreciation through a loyalty program offering personalized acknowledgments and perks. Additionally, the company considers involving this segment in testimonials or beta testing new features, as their insights are highly valuable.
- **Segment 2 – Lapsed Users:** The company aims for win-back and trust rebuilding with targeted re-engagement campaigns highlighting platform improvements since their departure. Special offers like discounted re-subscriptions or limited free trials address specific pain points to encourage renewed engagement.

- **Segment 3 – New and Infrequent Users:** Enhancing onboarding and engagement is key. Initiatives include an onboarding drip campaign with guided usage tips, tutorials, and feedback channels like in-app chat support or webinars. The goal is to prevent disengagement by actively supporting new users, converting them into loyal subscribers.
- **Segment 4 – Power Users:** Recognition and empowerment guide this approach. Strategies include creating advanced features such as custom drug lists or personalized dashboards. The company also plans to leverage these users as brand advocates through case studies or referral incentives, prioritize their service requests for reliability, and provide tokens of appreciation.
- **Segment 5 – Occasional Users:** Education and demonstrating platform value are central. The company develops tailored content and campaigns illustrating practical use cases, periodic engagement reminders, and considers introducing alternative pricing plans (e.g., pay-per-use or lower-cost subscriptions) to encourage increased platform usage among sporadic users.

These targeted strategies illustrate how each segment leads to actionable steps. Importantly, the company can measure the impact of these actions by tracking segment-specific metrics going forward. For example, after implementing the new onboarding program, has the average sessions for Segment 3 users increased? Or, what percentage of Segment 2 lapsed users responded to the win-back campaign with a renewed subscription? This segmentation provides a framework for continuous improvement: the company can continuously monitor how the size and behavior of each segment changes in response to business actions. If successful, one would expect the lapsed segment to shrink, the new user segment to transition into loyal users, and overall engagement to rise. From a deployment standpoint, the decision tree rules have been incorporated into the company's analytics dashboard. Now, whenever a user registers or their behavior data updates, the system can assign them to a current segment. The marketing database is automatically updated with a "User Segment" field, enabling filtering of users by segment for campaigns. This was a quick win for the marketing team, which previously had no such ability. They can now, for instance, pull a list of all Segment 2 users and send them a specific email, or target an advertisement only to Segment 3 users on social media about an upcoming training webinar. It's worth highlighting the collaboration between the data science team and the marketing team in this deployment phase. The data science team provided the technical assets (the clustering insights, the decision tree model), but the marketing and product teams provided the business context to make those insights actionable. This collaboration ensured that the technical solution translated into real business value – a crucial aspect of any data science project deployment. In conclusion, segmentation became integral to Etairia's operations. Deploying the decision tree and segment-specific plans transformed user engagement, with early positive signs such as increased renewal rates among targeted lapsed users. Though ongoing, these efforts provide a strong foundation for data-driven customer management.

5. DISCUSSION

The project's results underscore the business value derived from customer segmentation, transforming the company's previously homogeneous user approach into a targeted, data-driven strategy. Prior to segmentation, the firm addressed users uniformly, with marketing and product features that did not reflect differing user behaviors. Now, by distinguishing distinct user segments, communication and product development can be precisely tailored, significantly enhancing relevance and effectiveness. Early internal feedback indicates a clearer strategic alignment, moving away from anecdotal decisions toward informed, segment-based actions.

Initial business hypotheses were validated, particularly concerning user churn and power users. For example, identifying a segment of lapsed subscribers provided detailed insight into the reasons behind their departure, while recognizing power users clarified the profile of highly engaged customers. Immediate outcomes have already shown positive impacts, such as increased renewal rates among previously disengaged users and improved responsiveness to segmented marketing campaigns. The project also strengthened internal collaboration between data science and marketing teams, reinforcing a data-driven approach in strategic decision-making. Despite its successes, the segmentation had limitations. Clustering depended heavily on available quantitative usage data, lacking direct measures of qualitative factors such as user satisfaction or detailed feedback. Furthermore, clustering methods identify correlations rather than causal relationships, indicating the need for supplementary surveys or qualitative research to fully interpret user behaviors. Another limitation is the fluidity of user segments over time; behavior patterns can evolve, requiring periodic updates of the segmentation framework to maintain relevance. The clustering process also highlighted imbalance, particularly the presence of small or single-user clusters, complicating actionable strategies. Future improvements were identified to address these limitations, including enriching the dataset with additional engagement metrics, employing predictive modeling to anticipate user transitions, implementing A/B testing within segments for targeted interventions, periodically reassessing the segmentation structure, and integrating segment insights directly into platform personalization. Although the case is specific to a pharmaceutical information platform, its methodology demonstrates broad applicability, aligning with successful segmentation strategies across various industries. In conclusion, this segmentation effort significantly advanced the company's customer relationship management, establishing a foundation for ongoing, targeted strategic initiatives, despite recognized limitations and areas for future refinement.

4. CONCLUSION

In conclusion, this study successfully addressed a key business challenge for a pharmaceutical information platform by employing machine learning clustering methods to identify distinct user segments. The resulting segmentation provided actionable insights that transformed the company's approach, shifting from a uniform user strategy to targeted, segment-specific initiatives. Implementing these segments via a decision-tree classification model enabled seamless integration into marketing and product strategies, yielding promising early results such as improved renewal rates and enhanced user engagement. Overall, this project demonstrates how clearly defined business objectives combined with thoughtful application of standard machine learning techniques and domain expertise can effectively bridge the gap between data analysis and strategic business decisions.

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ROBUST AND BLIND DATA HIDING: A SURVEY OF CRYPTOGRAPHIC PROTECTION METHODS

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ABSTRACT

In the era of digital communication and data transmission, robust and blind data hiding techniques play a crucial role in ensuring security and confidentiality. Cryptographic protection methods serve as the foundation for safeguarding sensitive information, offering mechanisms that integrate encryption, steganography, and watermarking to prevent unauthorized access and data manipulation. This survey explores the principles and methodologies employed in robust and blind data hiding, emphasizing their significance in modern cybersecurity applications. Various cryptographic techniques, such as symmetric and asymmetric encryption, hash functions, and advanced encoding schemes, are analyzed to assess their effectiveness in maintaining data integrity while ensuring resistance against attacks. Furthermore, the paper examines the practical implementations and emerging trends in secure data embedding, discussing the challenges and potential improvements in enhancing robustness and imperceptibility. By providing a comprehensive overview, this research highlights the importance of cryptographic approaches in secure data hiding, aiming to contribute to the ongoing advancements in digital security and information protection.

Keywords: *Cryptography, Crypto Algorithms, Data hiding, Protection*

1. INTRODUCTION

Modern networking and data exchange between different devices often require secure positions in order to transmit and store them safely. Data security is essential so that adversaries cannot alter or read them. Passwords are the most well-known example, which go from our client systems to servers and are verified before granting us access to systems. These passwords are transmitted in an unreadable format. Therefore, cryptography plays a significant role in securing data both at rest and in transit. We have all heard of the concepts of encryption-decryption and end-to-end encryption. These terms have even become popular in the news through WhatsApp and other social media apps. Today, all digital activities involve the internet, applications, electronic services, and data. Whether you're shopping online or transferring money to someone's account, data is the key element that needs strong security. Thus, cybersecurity plays a major role in transforming normal data into another form. That domain of cybersecurity which encrypts or decrypts data at rest and in transit through various algorithms is called cryptography.

Cryptography (from kryptos meaning “secret” and graphein meaning “to write”) 1 is the science and art of concealing data and information in an unreadable format so that only the intended recipient can read or use it. In other words, it is the study of secure communication that allows only the intended recipient and, of course, the sender to view the contents of the message. Cryptography in cybersecurity involves using algorithms for encryption and decryption. Converting plain text (readable text) into cipher text (unreadable text) is called encryption, while the reverse process (cipher text into plain text) is called decryption. The effectiveness of cryptography depends on the robustness of the cryptographic algorithm and the size of the key. The roots of cryptography can be traced back to Egypt around 4000 years ago 2. Egyptians used hieroglyphs, the oldest cryptographic technique, for communication with one another. Then, by 500 BC, the approach evolved to character substitution using alphabets according to some secret rule. Digital signatures and end-to-end encryption in social media apps are examples of cryptography. Security professionals and organizations apply cryptography to provide confidentiality, integrity, non-repudiation, and authentication. Cryptography in cybersecurity plays a significant role, but just as there are advantages, there are also disadvantages to implementing cryptography in cybersecurity.

Advantages:

- It helps to hide messages and files at rest or in transit. Through cryptography, we can preserve the integrity of a message
- Digital signatures use cryptographic techniques to ensure non-repudiation in disputes where the sender denies having created the message
- With robust cryptographic algorithms, businesses can securely store passwords and other authentication details.

Disadvantages:

- Any failure in applications (websites) or technologies (database systems) can nullify the entire approach of using cryptography in cybersecurity
- Weak cryptographic keys can pose a risk to all the data stored in the system
- The entire concept of cryptography heavily relies on the complexity of mathematical algorithms or systems. Therefore, any flaw in the algorithm can also render the entire concept of using cryptographic techniques ineffective.

In the following text, we will describe cryptographic techniques and define the most important cryptographic algorithms in detail, along with an explanation of protection and decoding procedures. Finally, we will provide a comparison-based conclusion and recommendations for usage. Let me know if you need any refinements!

2. CRYPTO TECHNIQUES

Cryptographic algorithms are specific sets of codes that define how encryption and decryption of a file or message will work using one or more keys. The algorithm has two parts. Encryption defines the conversion of human-readable data (plain text) into something unreadable (cipher text) using a key. The second part of the algorithm, decryption, converts unreadable data (cipher text) back into a readable form (plain text). Generally speaking, cryptographic algorithms are classified into two main categories – symmetric and asymmetric 3. We will discuss these in the section on types of cryptography. There are numerous techniques used to conceal data and files through cryptography **Error! Reference source not found.:**

Hashing

In this technique, a string of data is converted into a unique string. Regardless of the form or type of data, hashing will change that data into a unique format and is irreversible. This means you cannot reverse the encryption process using a decryption technique in hashing. Hashing is used for password validation, file integrity checking, message integrity, blockchain technology, and other decentralized digital cryptocurrency systems. The hash function (e.g., SHA-256) $H(M) = h$, can be consider as mapping the message M (e.g., a password, file, or string) to the hash output h (fixed-size, e.g., 256 bits)

Steganography

This is another ancient cryptographic technique for hiding messages or data behind non-secret text, data, images, or other files. In this technique, the secret message is embedded within a file, making it extremely challenging to detect. Several decades ago, steganography was not as sophisticated as it is today. In past centuries, kings and queens used subtle variations in writing, invisible ink, and other techniques to conceal their messages. With the advent of digitization, security experts and terrorists now hide long texts or other content behind images, video files, and more.

Salting

This is another cryptographic technique used in hashing to enhance and obscure the data. Just as salt enhances the flavor of food, the salting technique strengthens the hashing process. A random string of salt can be added to both sides of a password to alter the hash string of the password. Such a unique hash created by combining salted passwords defends against various attack vectors such as brute force, dictionary, and hash table attacks. Benefits:

- Prevents rainbow table attacks – precomputed hash databases won't work because of the salt.
- Defends against mass cracking – even if two users have the same password, their hashes are different.
- Adds randomness – attackers can't easily predict or reuse hashes.

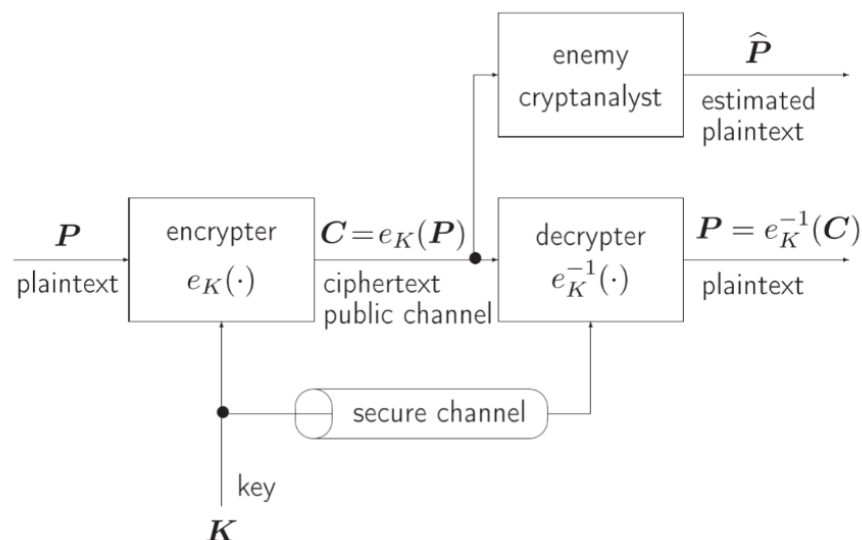


Figure 3 – Model of the Crypto system 5

2.1. Features of Cryptography

Cryptography in cybersecurity plays a significant role across various disciplines. In today's digital-centric world, cryptography is most commonly used in authentication, data communication, information storage, etc.

- **Data Confidentiality:** This cryptographic feature helps encrypt user data so that unintended users cannot understand the content.
- **Non-repudiation:** This technique uses cryptography to ensure that the sender or recipient cannot deny the creation or transmission of information.
- **Integrity:** This cryptographic feature ensures that no one can alter or tamper with information transmitted between the sender and intended recipient without adding extra data or changing the signature.
- **Authentication:** This feature helps authenticate the digital identities of the sender and recipient. It also determines the destination and origin of the data so that information can securely flow in network communication.

2.2. Types of Cryptography

Now that we have a clear understanding of the two different types of attacks in cryptography, let's explore the types of cryptographic systems. Every cryptographic algorithm we encounter falls into one of the following categories, depending on the number of keys used or the type of encryption/decryption process it involves 6.

- **Symmetric Encryption:** This type of cryptography uses a single key for both encryption and decryption. This technique is also known as secret-key cryptography. The sender uses a secret or private key to encrypt the message (convert plaintext to ciphertext). The same secret key is required on the recipient's side to decrypt the message (convert ciphertext back to plaintext). Since this technique uses only one key, the sender must securely share the secret key with the recipient for decryption. AES, DES, 3DES, Blowfish, etc., are examples of symmetric key cryptography.
- **Hash Functions:** Hash functions are mathematical functions used in cryptography to convert numerical input data into another compressed numerical value. The input to the hash function can vary and be of any length, while the output will always be of a fixed size. A cryptographic hash function includes message digest techniques to enhance security. Hashing functions offer varying levels of complexity and computational cost. Security experts and researchers use hash functions for password protection and securing data/messages. Bitcoin, the largest cryptocurrency, uses a cryptographic hash function known as SHA-256 (256-bit, hence the name) in its algorithm. Similarly, IOTA, an Internet of Things platform, uses its own cryptographic hash function called Curl.
- **Asymmetric Encryption:** This is another widely used cryptographic method that uses two different keys (a public key and a private key) for encryption and decryption. It is also known as public-key cryptography. The process is different from secret-key cryptography. In this technique, the sender uses the recipient's public key to encrypt the message. The public key can be freely distributed, and anyone with it can send a message to the recipient. The private key, held only by the recipient, is used to decrypt the message. The public key is accessible to everyone, while the private key remains confidential. Some well-known examples of asymmetric encryption algorithms include Rivest-Shamir-Adleman (RSA) encryption, Elliptic Curve Cryptography (ECC), the SSL/TLS protocol, Diffie-Hellman key exchange, and the Digital Signature Standard (DSS)7.

3. CRYPTO ALGORITHMS

3.1. Symmetric cryptographic algorithm

The group of **symmetric cryptographic algorithms** includes those in which the encryption key is identical to the decryption key. Algorithms in this group are also called secret-key algorithms, as the secrecy of the key used for both encryption and decryption is essential for maintaining the security of messages in the system. These systems form the foundation of traditional cryptographic theory and have been developed over a very long period. Given that information protection has primarily been applied in state-related operations (military, police, and diplomacy), these systems were originally strictly classified, purpose-built and implemented by authorized state institutions. With the rise of electronic communication, the need for publicly defined symmetric cryptographic algorithms emerged. Over the last decade, several public symmetric cryptographic algorithms have been introduced for use in applications where such a need exists. These algorithms are mainly used in business and financial communication systems. Considering the explosive growth of business and financial systems in recent years, public symmetric cryptographic algorithms have become dominant in terms of usage. However, none of them have been adopted as a universal standard. Instead, these systems typically rely on a list of acceptable cryptographic algorithms. During a given transaction, a parameter in the communication will include an identifier of the symmetric cipher algorithm to be used. Although commercial use of symmetric cryptographic algorithms has far exceeded their use in classified state-related sectors, most of the theoretical advancements in the field still occur within secret cryptology and classified systems. The majority of countries have specialized agencies responsible for designing and analyzing various types of cipher systems (e.g., the NSA in the United States). The level of progress in this field is typically not publicly disclosed and remains in the realm of speculation. Symmetric encryption uses the same key for encryption and decryption. Let m is a plaintext message, k is the secret key, c is a ciphertext, E_k and D_k are an encryption and decryption functions respectively both using key k , then

$$c = E_k(m); m = D_k(c)$$

3.2. Asymmetric encryption

A widely used algorithm is AES (Advanced Encryption Standard). AES operates on blocks of 128 bits, using a key of 128, 192, or 256 bits. It includes several steps: SubBytes (S-box substitution) - A nonlinear byte substitution using a substitution box (S-box), which is built from finite field inverses in $GF(2^8)$ followed by an affine transformation; ShiftRows - A permutation step: rows of the 4×4 state matrix are cyclically shifted; MixColumns - Each column is treated as a 4-term polynomial and multiplied (modulo an irreducible polynomial) with a fixed matrix in $GF(2^8)$.

RSA Algorithm

For the two large prime numbers $p, q \in \mathbb{P}$ we compute modulus $n = p \cdot q$ and Euler's totient $\varphi(n) = (p - 1)(q - 1)$. For the public exponent e such that $1 < e < \varphi(n)$, $\gcd(e, \varphi(n)) = 1$ we will compute private key d :

$$e \cdot d \equiv 1 \pmod{\varphi(n)}.$$

Encryption phase involves ciphertext $c = m^e \bmod n$ for the message $m \in \mathbb{Z}_n$. Decryption phase will be

$$m = c^d \bmod n.$$

AES - MixColumns Transformation

Each column in the state matrix is transformed using matrix multiplication in $GF(2^8)$.

$$\begin{bmatrix} 02 & 03 & 01 & 01 \\ 01 & 02 & 03 & 01 \\ 01 & 01 & 02 & 03 \\ 03 & 01 & 01 & 02 \end{bmatrix} \cdot \begin{bmatrix} b_0 \\ b_1 \\ b_2 \\ b_3 \end{bmatrix}$$

Where are b_i bytes in column.

ECC (Elliptic Curve Cryptography)

For the point on the curve P , and a secret scalar (private key) k and the public key Q , Curve Equation over a prime field $\mathbb{F}_p$ can be calculated as $E: y^2 \equiv x^3 + ax + b \pmod{p}$ and scalar multiplication as $Q = kP$.

SHA-256 - Boolean Functions

Example logical functions used in SHA-256 and 64-round compression loops:

$$Ch(x, y, z) = (x \wedge y) \oplus (\neg x \wedge z)$$

$$Maj(x, y, z) = (x \wedge y) \oplus (x \wedge z) \oplus (y \wedge z)$$

3.3. Sequential Cipher Systems

Sequential cipher systems represent a very important class of cipher algorithms. They transform individual characters (most commonly bits and bytes of plaintext) using a transformation that, in addition to the key, also depends in a specific way on the point in time at which it is applied. In contrast, block cipher systems transform blocks of plaintext using an unchanging transformation throughout the encryption of the entire message 10.

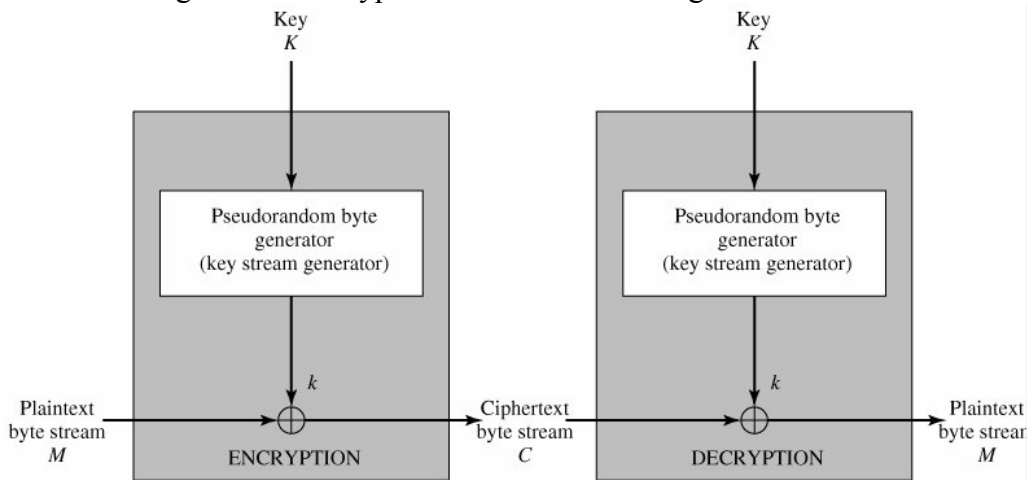


Figure 4 – Model of the Sequential Cipher Systems 10

As usual in practice, this distinction is not so rigid—there are transformations that, by their characteristics, can be classified into both types. For example, the **CFB** (Cipher Feedback) and **OFB** (Output Feedback) modes of block cipher systems possess some characteristics of sequential cipher systems. On the other hand, sequential cipher systems can be considered block ciphers where the block length is one character (bit, byte, or machine word of 16, 24, or 32 bits). Generally speaking, a sequential cipher system consists of a **key stream generator** (Figure 3), which generates a stream of key units $k_1, k_2, \dots, k_i, \dots$ and a function f which is applied to a stream of message units $m_1, m_2, \dots, m_i$, producing a stream of ciphertext units $c_1, c_2, \dots, c_i$, based on the following relation $c_i = f(k_i, m_i)$.

At the other end of the communication (see figure 16), the inverse function is applied to the pairs of ciphertext units and key units to retrieve the original plaintext units. This can be expressed by the following relation $m_i = f^{-1}(c_i, k_i)$. Since the function f is chosen such that $m_i = f^{-1}(f(m_i, k_i), k_i)$.

3.4. RC4

RC4 is certainly one of the best-known and most popular sequential cipher algorithms. It was designed in 1987 by Ron Rivest for the company RSA Security 11 It is a sequential cipher system with variable key length and byte-oriented operations. The algorithm is based on the use of random permutations. Analyses have shown that the key repetition period is around 10^{100} . Between eight and sixteen machine operations are needed to produce one output byte of data (ciphertext byte), so it is expected that the algorithm performs very fast in software implementations. RC4 was used in SSL/TLS (Secure Socket Layer / Transport Layer Security) protocols and standards, which are defined as protection at the transport layer.

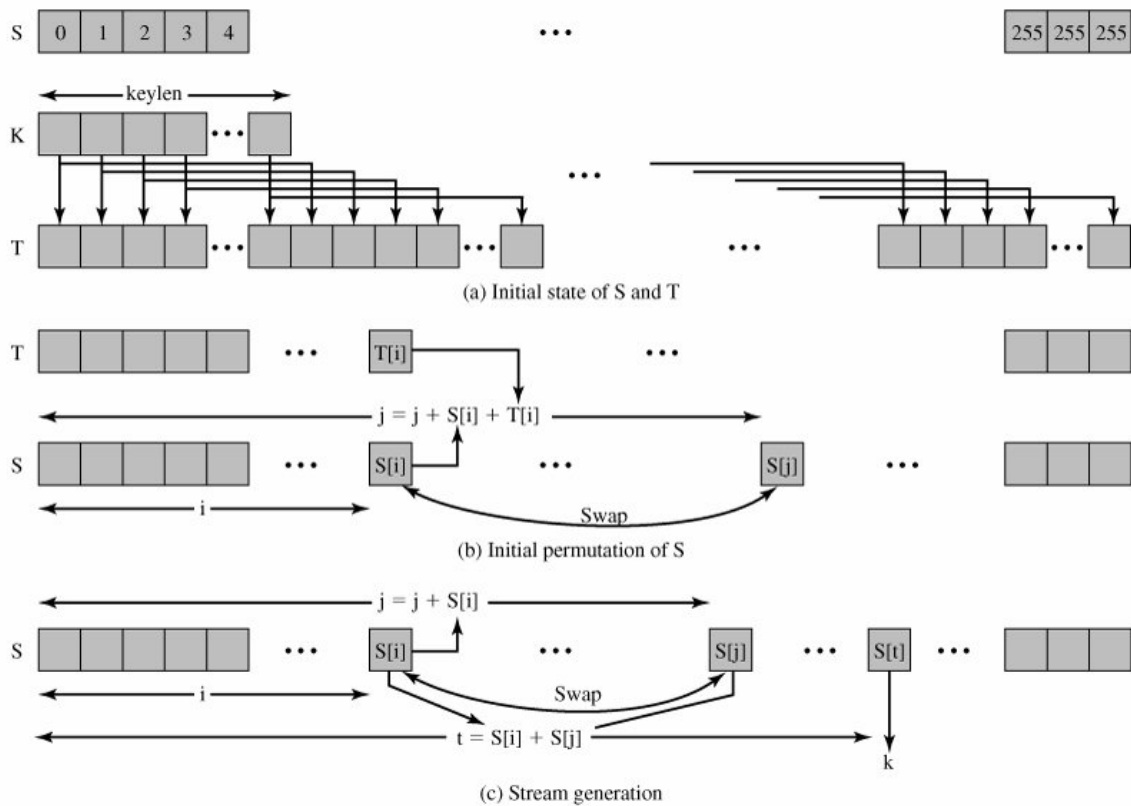


Figure 5 – Graphical representation of the RC4 algorithm 84 11

RSA Security kept the RC4 algorithm strictly confidential until September 1994, when an anonymous person published details about the algorithm on the Internet, a leak that remains anonymous to this day. The RC4 algorithm is very simple and easy to explain. It operates with a variable-length key – from 1 to 256 bytes (i.e., 8 to 2048 bits). It also uses a state vector S of size 256 bytes, with elements $S[0], S[1], \dots, S[255]$. At any given time, the vector S contains a permutation of all 8-bit numbers from 0 to 255. For encryption and decryption, a key byte k (size 1 byte) is generated using the vector S , by selecting one of the entries in S according to a predefined order. After generating each key byte k , the elements of the vector S are re-permuted. The initialization of the vector S is very simple. At the very beginning, the elements of vector S are filled with values from 0 to 255 in ascending order, so that $S[0] = 0, S[1] = 1, \dots, S[255] = 255$. Also, for the purpose of encryption, a temporary vector T is created.

If the length of the key K is 256 bytes, then the entire key is simply copied into vector T . In other cases, when the key length is keylen (for which $1 < \text{keylen} < 256$), the first keylen fields of vector T are filled with the key K , and then K is repeated as many times as necessary to fill the entire vector T .

3.5. *Block Cipher Systems*

Block cipher systems process blocks of plaintext (PT) and ciphertext (CT), typically in blocks of 64 bits or more¹². Stream cipher systems process sequences of bits, bytes, or words (16 or 32 bits) of PT and CT. If, during the encryption process of a message using a block cipher system, the same block of plaintext appears multiple times, the result will always be the same ciphertext block. This is not the case with stream cipher systems. In stream cipher systems, the probability that the same sequence of bits, bytes, or words of plaintext will produce the same ciphertext each time it appears in a message tends toward zero, assuming the keystream and plaintext are independent. Block cipher systems are heavily used in business and financial transaction systems, although their security properties are significantly weaker than those of stream cipher systems. Nevertheless, a large number of public algorithms based on block cipher systems have been defined, such as DES, 3-DES, RC2, IDEA, and many others, which have found wide application in modern information systems. In 2001, the NIST organization in the USA adopted a new standard: AES (Advanced Encryption Standard)¹³.

Feistel Cipher Structure

As mentioned in the previous paragraph, block cipher systems process blocks of plaintext of length n bits and produce ciphertext blocks of the same length n bits. Combinatorics theory tells us that there are 2^n possible different plaintext blocks. For encryption to be reversible (i.e., for decryption to be possible), the algorithm must be such that each plaintext block produces a unique ciphertext block. The following example (**Table 2**) illustrates reversible and non-reversible transformations for $n = 2$.

Reversible		Irreversible	
Open text	Ciphertext	Open text	Ciphertext
00	11	00	11
01	10	01	10
10	00	10	01
11	01	11	01

Table 2 - Example of reversible and irreversible transformation

3.6. *DES Algorithm*

Data Encryption Standard (DES)¹³ is undoubtedly one of the most well-known and widely used symmetric cryptographic algorithms. It processes data in 64-bit blocks using a 56-bit key. The algorithm transforms the 64-bit input data block, processes it through a series of steps – rounds – and produces a 64-bit output data block. This algorithm has been very popular and has often been the subject of various disputes aimed at proving how secure it is. LUCIFER from IBM represents Feistel's block cipher and processes 64-bit data blocks using a 128-bit key¹⁴. As the results of this project were positive, IBM decided to take a bold step and develop a commercial cryptographic algorithm that could be embedded in a single chip. This effort was supported by Walter Tuchman and Carl Meyer.

The general scheme of encrypting a data block using the DES algorithm is shown in **Figure 6** – General scheme of DES coding. From the image, it is evident that the algorithm has two input values: a 64-bit data block and a 56-bit key. Looking at the left half of the image, we can see that the encryption process takes place in three phases. First, the 64-bit plaintext undergoes an initial permutation (IP), which rearranges the bits to produce a permuted input. After that, the second phase begins, consisting of 16 rounds, in which the same function is repeated. This function includes both substitution and transposition ciphers. The output of the second phase (i.e., the output after the sixteenth round) is 64 bits, representing the result of a function that depends on both the plaintext and the key. After the 16th round, the left and right halves of the block switch places, producing the so-called preoutput value. In the final, third phase, this preoutput value undergoes a permutation, which is the inverse of the initial permutation (IP⁻¹). This produces a 64-bit ciphertext block. With the exception of the initial and inverse initial permutations, DES fully adheres to Feistel cipher structure. The right side of figure shows how the 56-bit key is used. Nominally, the key is 64 bits long, but only 56 bits are utilized since every eighth bit serves as a parity check bit for even parity. Initially, the key undergoes permutation. After that, for each of the 16 rounds, the round subkey (k_i) is calculated as a result of a combination of circular left shifts and permutation of certain elements. The permutation operation remains the same across all 16 rounds, but they still generate different subkeys due to the circular left shifting.

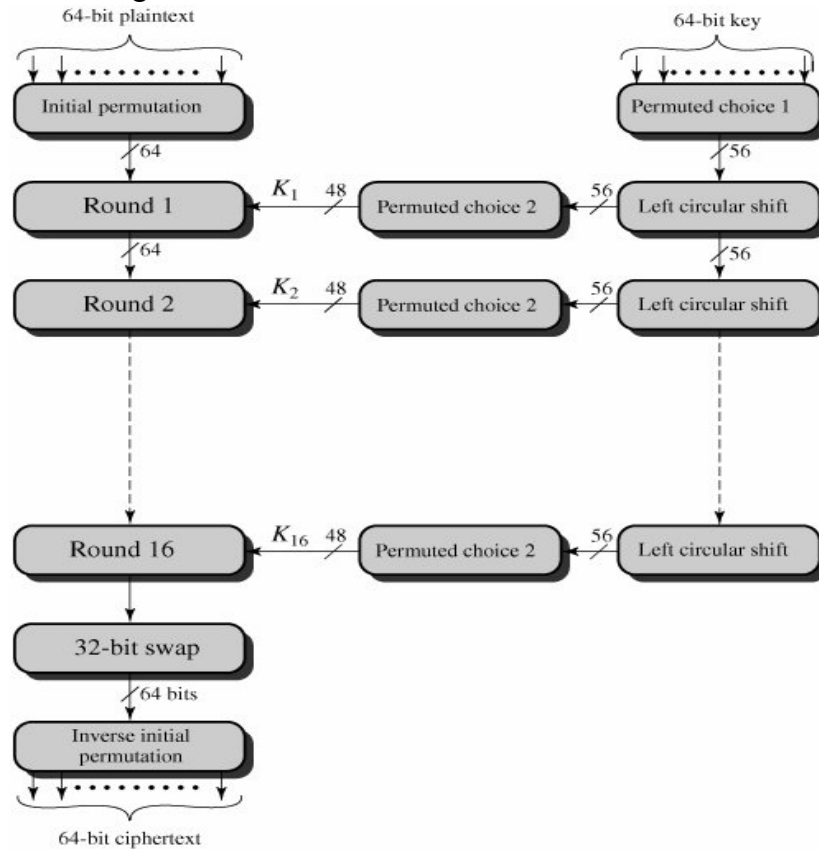


Figure 6 – General scheme of DES coding

The DES encryption process follows the Feistel cipher structure, and its core mathematical operation can be expressed as $[L_{\{i\}} = R_{\{i-1\}}]$, $[R_{\{i\}} = L_{\{i-1\}} \oplus \mathcal{F}(R_{\{i-1\}}, K_{\{i\}})]$, where $L_{\{i\}}$ and $R_{\{i\}}$ are the left and right halves of the data block at round i , $K_{\{i\}}$ is the subkey for round i , and $\mathcal{F}(R_{\{i-1\}}, K_{\{i\}})$ is the Feistel function, which includes expansion, substitution (S -boxes), and permutation. ($\oplus$) represents the bitwise XOR operation.

Permutation Structure of DES

For a fixed key K , DES defines a permutation of the set $\{0,1\}^{64}$, whose order is 2^{56} . The question arises: Is DES (i.e., the set of all its permutations) a subgroup of this larger group? The answer is negative. Specifically, the set of all DES permutations is not closed. More precisely, it is known that the order of the subgroup generated by all DES permutations is greater than 2^{2499} . This fact is significant because it demonstrates that multiple applications of DES can achieve greater security.

3.7. IDEA algorithm

The predecessor of International Data Encryption Algorithm (IDEA) was first published in 1990, created by Xuejia Lai and James Massey [16]. Initially, it was named PES (Proposed Encryption Standard). The following year, after a differential cryptanalysis method was demonstrated, the authors strengthened the algorithm and made it resistant to this type of attack. After this enhancement, the algorithm was renamed IPES (Improved Proposed Encryption Standard). In 1992, it received its current name: IDEA. The IDEA algorithm encrypts plaintext in 64-bit blocks using a 128-bit key. The transformation of the plaintext occurs over eight cycles, and after the final cycle, the ciphertext is produced. For a given 64-bit plaintext $M = m_1, m_2, \dots, m_{64}$ and a 128-bit key $K = k_1, k_2, \dots, k_{128}$, the encryption process proceeds as follows.

The key K is divided into eight 16-bit blocks, forming subkeys $K_1^{(1)}, K_2^{(1)}, \dots, K_6^{(1)}, K_1^{(2)}, K_2^{(2)}$. Then, the 128-bit key undergoes cyclic left shifting by 25 bits. The resulting value is divided into eight more 16-bit blocks assigned to subkeys $K_3^{(2)}, K_4^{(2)}, K_5^{(2)}, K_6^{(2)}, K_1^{(3)}, K_2^{(3)}, K_3^{(3)}, K_4^{(3)}$. This process is repeated until 52 subkeys are obtained:

$$\begin{aligned} &K_1^{(1)}, K_2^{(1)}, \dots, K_6^{(1)} \\ &K_1^{(2)}, K_2^{(2)}, \dots, K_6^{(2)} \\ &\vdots \\ &K_1^{(8)}, K_2^{(8)}, \dots, K_6^{(8)} \\ &K_1^{(9)}, K_2^{(9)}, K_3^{(9)}, K_4^{(9)} \end{aligned}$$

Setting initial values of 16-bit variables $X_1 = m_1 \dots m_{16}$, $X_2 = m_{17} \dots m_{32}$, $X_3 = m_{33} \dots m_{48}$, $X_4 = m_{49} \dots m_{64}$ for p from 1 to 8, the encryption operations for each round take place:

$$\begin{aligned} X_1 &= X_1 \odot K_1^r, X_2 = X_2 \oplus K_2^r, X_3 = X_3 \oplus K_3^r, X_4 = X_4 \odot K_4^r, \\ t_0 &= K_5^r \odot (X_1 \oplus X_3), t_1 = K_6^r \odot [t_0 \oplus (X_2 \oplus X_4)], t_2 = t_0 \oplus t_1 \\ a &= X_2 \oplus t_2, X_1 = X_1 \oplus t_1, X_2 = X_3 \oplus t_1, X_3 = a, X_4 = X_4 \oplus t_2 \end{aligned}$$

The final transformation produces four 16-bit blocks, which are concatenated to form the ciphertext of the original plaintext block.

4. CONCLUSION

Cryptographic algorithms and data protection play a crucial role in securing information in an increasingly digital world. As technology advances, the need for robust encryption mechanisms becomes more apparent, ensuring confidentiality, integrity, and authenticity of data. Reviewing cryptographic algorithms, such as DES, IDEA, and RC4, highlights the evolution of encryption methods, showcasing both their strengths and vulnerabilities. Each algorithm reflects different encryption strategies, whether through sequential processing in stream ciphers or structured transformation in block ciphers. These variations demonstrate the ingenuity behind cryptography and its constant adaptation to emerging security threats.

Sequential cipher systems, commonly known as stream ciphers, encrypt data **one bit or byte at a time**, generating a keystream that is combined with plaintext using bitwise operations. This approach is particularly useful in environments where data transmission occurs in real time, such as wireless communication and secure messaging. RC4, a widely recognized stream cipher, initially gained popularity due to its speed and simplicity. However, weaknesses in its key scheduling process made it vulnerable to cryptanalysis, leading to its gradual deprecation in favor of stronger encryption methods. Meanwhile, block cipher systems, such as DES and IDEA, encrypt data in **fixed-size blocks**, applying complex mathematical transformations across multiple rounds to produce a secure ciphertext. Block ciphers offer structured encryption approaches that prevent patterns from emerging, making them well-suited for applications requiring high security, including financial transactions and government communications. As computing power increases and new cryptanalysis techniques emerge, cryptographic algorithms must continuously evolve to stay ahead of potential vulnerabilities. While DES was once a standard, its relatively short key length made it susceptible to brute-force attacks, prompting advancements like AES. Similarly, IDEA was developed with improved resistance to differential cryptanalysis, ensuring stronger data protection. The balance between efficiency and security remains a key consideration in cryptography. Whether through sequential cipher systems like RC4 or structured encryption in block ciphers, the ultimate goal remains the same: safeguarding information from unauthorized access and ensuring the reliability of secure communications in an increasingly digital landscape.

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THE LEGAL SYSTEM OF THE REPUBLIC OF SERBIA IN THE JAWS OF BIPOLAR OR MULTIPOLAR ENVIRONMENT

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ABSTRACT

Major changes are underway on a global scale, which are certainly having an impact on individual countries. The aim of this paper is to briefly reflect on the state of our legal system and, where appropriate, propose additions to ensure it is prepared to meet the challenges posed by these global changes. A brief overview of certain current laws, an analysis of the present state, and proposals for extensions will be carried out using descriptive, normative, comparative legal, sociological, and other relevant methods. In the second part of the paper, a legal-philosophical consideration of the principles of justice within the legal system will be presented. The paper begins with an analysis of the provisions of the Law on Obligations, which reflect the relationship between private and public law, public order, and business rules. Furthermore, through a specific example, attention is drawn to the importance of language and legal terminology prior to implementing changes. In the following section, a brief overview of law and justice is provided, emphasizing justice as a principle that must not be forgotten, regardless of the type or extent of changes. In conclusion, the positive development of our legal system is noted, and a modest proposal for regulatory changes is offered in anticipation of the upcoming and expected transformations.

Keywords: *Law, justice, legal system, public law, private law*

1. INTRODUCTION

In the modern world, significant and far-reaching changes are taking place that affect, and are expected to continue affecting, certain countries and their social, economic, and legal systems. At present, it is impossible to predict what the world order will look like in a few years or how extensive these changes will be. Furthermore, important questions arise: What will business conditions be like in a bipolar or, alternatively, a multipolar world order? What will be the conditions for market operations? Where will capital flows be directed? What will be the circumstances for reproduction, development, import, and export? In this paper, we will examine these questions, focusing on the changes occurring in the world and their impact on the business environment of our country, primarily on our legal system. We will provide predictions that must be explained and supported by the results of our analysis. Subsequently, we will analyze our legal system in light of the main impacts of these changes, employing descriptive, normative, comparative law, sociological, historical, and other relevant methods. We will also present a perspective on the preservation of our language, particularly our legal terminology, in modern times.

The paper will offer specific proposals for changes to the legal system that would better equip it to meet the demands of new times and evolving circumstances in both life and business, that is, in legal life. Additionally, a brief legal-philosophical reflection on law and justice will be included, recognizing that, while we are sometimes dazzled by technological advancements, we must not neglect or forget that the legal system governs interpersonal relations and embodies certain principles that give it tone and character.

2. RELATIONSHIP OF PRIVATE AND PUBLIC LAW, PUBLIC ORDER

We have emphasized the importance of law as a normative activity, a characteristic that significantly affects the relationship between law and the economy in a country. The law prescribes the framework, principles, procedures, and obligations of market participants, thereby defining economic relations within a country through the existence of fundamental acts, prescribed principles, and established procedures. If legal norms do not change frequently, they contribute to the stability of business conditions, which is one of the basic requirements of a private market economy. The development of the relationship between private and public law can be traced both historically and in the present day. Currently, there is a noticeable increase in the number of authors (such as Vodinelić, among others) who argue that there is no distinction between the norms of private and public law. In this article, we discuss both public and private law, focusing primarily on private law, which upholds the principle of autonomy. However, the majority of authors recognize the difference between public and private law and understand its significance. In practice, this distinction is acknowledged, but theoretically, the situation remains uncertain. Proponents of the anti-distinction view are numerous and influential. They strive to introduce the principle of command and subordination universally, disregarding the well-established practical position that there can be no development without new initiatives, private enterprise, and private law. In a work of this scope, it is most effective to examine the provisions of our Law on Obligations (29/78) to better understand the practical relationship between public and private law, as it defines both freedom of contract and public order. The contract, as the foundation for the exchange of goods and services in our legal system, should serve as an instrument of maximum freedom for business entities, and this is precisely what our law prescribes. The law stipulates the autonomy of will: "Parties in contractual relationships are free, within the limits of mandatory regulations, public order, and good customs, to arrange their relationships according to their will" (Art. 10 of the Law on Obligations). Alongside the prescribed principles—such as equality of the parties, conscientiousness and honesty, and the prohibition of abuse of rights, the law aligns with the best international regulations regarding contractual freedoms. Rather than imposing special restrictions on business operations, it provides a secure foundation for them. We can use the expression "public order," which is the standard in various countries and serves to limit the freedom of contracting. In Anglo-Saxon law, the term "public policy" (Stojanović, 1968, p. 386) functions as a control on the freedom of contract. "There is no single, precise definition of 'public policy,' and therefore no absolute rule by which a contract can be measured, examined, and determined as contrary to public policy." American jurisprudence has identified certain contracts as contrary to public order, such as contracts that cause harm to the community, the public good, one's own or a friendly country, contracts involving bribery, evasion of the law, restrictions on the freedom to marry, and so on (Hippel, 1963, p. 41). The French Code civil uses the term "ordre public" and stipulates that inviolable laws are enacted in the interest of public order and good morals (Simitis, 1960, p. 83). The German Civil Code prescribes: "There is no legal transaction that is contrary to good morals" (Hippel, 1963, p. 113). It does not mention public order, as it is considered imprecise, but rather refers to actions against the legal and moral order. American jurisprudence links the moral order to family and marital relations, or "good morals." In our law, public order is tied to mandatory regulations and morality, which is a free, commercial, and, one might say, liberal concept that aligns with our reformed economy. We have passed the new Capital Market Law (129/21). Here, we will refer to the view often stated in our literature that form contracts carry the risk that the economically stronger party may not benefit. While there is a risk, it is minor. From contracts emerged in the era of mass production, in market economies, and in developed markets. Time is money; time affects productivity.

There is neither time nor need for negotiation, as the form contract is crafted to best suit the needs of fast, mass trade and mass interconnections, something planned socialist economies do not recognize. In addition to this brief reflection on the provisions of the Law on Obligations and noting the principles and quality derived from our Constitution, the Law on Business Companies, the aforementioned Capital Market Law, and others, we see that legal regulations will not be a limiting factor for work, progress, or adaptation to the circumstances of business and international trade. Our legal system is ready for the upcoming changes. Naturally, our managers should be freed from ideology and focus on personal and national benefit, considering the balance of interests in exchange and trade. Only in this way will they make a real contribution to the development of the gross social product of our economy. This is the only way we can take advantage of our geographical position. A major disadvantage is that, through historical changes, we did not preserve access to the sea, which would have allowed us to capture at least a small share of trade from African countries to Europe and the rest of the world, and to take advantage of the good political relations we have. It is necessary to analyze the needs of less developed countries and our capacity to meet those needs—at least through trade, if not through production. However, it would be best to produce what we can and what they need. Our defense industry is an example, but other metal industries should follow that example. We are unable to export more agricultural products to the European Union (hereinafter referred to as the EU) due to the highly developed agriculture within the EU, as well as substantial subsidies provided to their producers. While it is certain that we possess arable land and other favorable conditions, we lack sufficient organization. If our merchants encounter difficulties in selling raspberries, let foreign merchants participate. If foreign retailers unjustifiably raise prices, establish local retailers who have an interest in offering lower prices. Enable healthy competition. Compete effectively. However, do not import low-quality pork simply because domestic pork is expensive; do not render domestic production pointless. Instead, analyze resources and opportunities for competitiveness so that competition serves as an incentive rather than a discouragement. In any case, conduct a thorough analysis to justify decisions regarding imports or exports. This way, farmers can become competitive within a year through reorganization, as was done in Hong Kong and South Korea. The potential for progress and all the aforementioned points are unrelated to whether the world is bipolar or multipolar. As we write in this paper, this issue is becoming less significant than it was before the US election. Although, in principle, a multipolar world offers more freedom, which benefits trade and international economic relations, what truly matters is where capital and technology are located. Our authorities are making every effort to attract foreign investment, which is positive, but such investments should be integrated into our economic system. We should offer semi-finished products and components at lower prices than the rest of the world, if only due to reduced transportation costs. China once followed this approach. China is now rapidly automating, robotizing, and digitizing its economy. This is a new development that must be taken into account. The impact of this increased competitiveness remains to be fully seen, although much of it has already occurred in the West. It is necessary, as with a dedicated industry, to pursue further development, including the mandatory production of helicopters—we already have a license for the Gazelle helicopter and for an airplane in addition to the Swallow—because we see that resources are being lost in war. This would positively affect our overall technological development and resilience, reduce unemployment, and encourage companies to grant scholarships to talented students and hire them during their studies. We lack engineers. The position of our economy has never been simple, but we have geographical and natural advantages and opportunities. Lithium should be exploited, but on a smaller scale than initially planned, as it is a limited resource. With technological advancements in the global market, its price may increase even further, although it is already high.

Our researchers and authors of economic texts often have a one-sided, sometimes ideological, view of relationships with global corporations. If these corporations wish to produce something locally, bring in technology, or supply us with products we cannot manufacture ourselves, for whatever reason, they are not harmful. They become harmful only when they obtain a monopoly on trade. There are claims that the international oligarchy is at work: "compradors are being prepared in advance who would take key positions in the state at the right moment..." (Dušanić, 2020, p. 53). However, no evidence is provided for these claims. Other foreign factors are also not considered, such as the inflow of development capital, which brings better, more modern technology and contributes to overall development. China and Russia have recognized this. It could be mandated in our country that all major contracts are reviewed by the entire government, although this is already largely the case.

2. LEGAL TERMS

It is necessary to be aware of issues from completely different perspectives and to act consciously in international economic and legal business. We must protect our legal expressions, and the multipolar world will assist us in this endeavor. Although international relations are most often conducted in a foreign language, which is an imperative for economic activity, domestic legal expressions should be preserved within our own country. This is a matter of both personal and general culture. Let us not forget the saying that culture and beauty will save us. An example from our legal system will be presented. But before that, we will offer a brief reflection on the history of some legal expressions, thereby demonstrating their value—historical, narrative, and, if we wish, legal-philosophical—in the understanding of a society, that is, a state. In addition to property rights, we distinguish between ownership, the right of ownership, state property, and estate. Sometimes these terms are used as synonyms, but they each have their own distinct meanings, reflecting the richness of language and the legal terminology of our legal system. Please note that "property" is an indivisible term when it comes to a legal subject, encompassing both debts and claims, as well as the real rights of the subject, whereas property can refer to all assets or to a specific asset belonging to a person. Even in ancient Greece, the concepts of property and ownership were known. In ancient Rome, no formal definition of property was given, but the creation and prescription of this right—as a basic civil right—were established, along with the crystallization of the term for that right: *proprietas* or *dominium* (Stojčević, 1968, p. 103). The Romans considered their property to be "complete power over things" (*plena in re potestas*), which consisted of three rights: *usus*, the right to use the thing; *fructus*, the right to obtain natural and civil fruits from the thing; and *abusus* (Stojčević, 1968, p. 116), the right to dispose of the thing during life (*inter vivos*) or in the event of death (*mortis causa*). The term "property" was referred to as *bona* by the Romans; it was a praetorian right, created by the action of the praetor, and sometimes called *patrimonium* and *familia pecuniaque*. This means the community of the term *familia*—people and things as a whole—including both present and future members of one family, and *pecunia* (Stojčević, 1968, p. 104), a herd outside the house and its immediate surroundings. The three rights, methods, or elements of property rights are defined differently by some authors: as the right to hold (*ius possidendi*), the right to use (*ius utendi*), the right to harvest fruits and other income (*ius fruendi*), and finally, the right to dispose (*ius disponendi*) (Stanković & Vodinelić, 2007, p. 157).

Here is the translation of the specific provision:

Protocol (2007) to the Convention on Human Rights and Fundamental Freedoms, Paris (March 20, 1952)

Article 1. Protection of Property

Every natural and legal person has the right to the peaceful enjoyment of their property. No one shall be deprived of their property except in public interest and subject to the conditions provided by law and by the general principles of international law. However, the preceding provisions shall not in any way impair the right of the State to enforce such laws as it deems necessary to control the use of property in accordance with the general interest or to secure the payment of taxes or other contributions or penalties. In the aforementioned Serbian translation, in Article 1 of the Protocol to the Convention, the term "property" is used throughout the text. Let us compare in the official English version, the word "property" is used in the heading, after which the word "possessions" appears. In the French version, the term "propriété" is used at the beginning, followed by "biens," and the term "biens" refers to property rights (pecuniary rights) in the official French text. Based on these facts, and in accordance with the view of Prof. Dragoljub Popović, he proposes the use of the term "imanja" in the Serbian translation, "which is neutral and quite suitable for this occasion" (Popović 2012, p. 396). The aforementioned professor notes that this term does not fully correspond to the concept of "property" as understood in the national laws of the member states of the Council of Europe (Popović 2012, p. 396). With regard to Article 1 of the First Protocol, "property" is a term that cannot be simply defined. The content of this term can only be understood in light of judicial practice relating to the aforementioned provision (Popović 2012, p. 396). At this point, it is necessary to examine the problem more fully and deeply. The terms "property," "ownership," and "estate" are used as synonyms in our law, with recognized slight nuances, but for the sake of legal precision, let us consider this issue further. For example, in the Law of Obligations, the term "property" is used in Articles 155 and 210 as a property unit, and in Article 452 in the context of craft shops and similar cases. In the Civil Code of Serbia (SGZ), "property" is used regularly, including several times in Titles 9, 10, 11, 12, 13, and 14. The same term is used in our positive law in the Inheritance Act, as well as in the Austrian Civil Code (AGZ) and the General Property Code for Montenegro. In all civil codes of the former Yugoslavia, the term "property" was used, and only exceptionally "ownership," as in Stupar's Collection. Let us consider what legal science and theory say about the term "property." Today, despite being both highly praised and strongly contested, the classic subjective (personalist) theory of the great French jurists Aubry and Rau still prevails. According to this theory, a person's property theoretically includes all their assets, "without distinction," including both "present and future assets" (*Cours de droit civil français*, Paris, 1917, 573, pp. 333-334) (Stanković & Vodinelić 2007, p. 142). According to this theory, property is indivisible, much like personality itself. Legal capacity is considered an integral part of property, which means it is non-transferable. Property is separated from the person only at the time of death. It is difficult to argue that these are also good assets. The term "property" has acquired a broader, more comprehensive, and unique meaning. The conclusion that follows from everything presented is that, before the European Court of Human Rights, "property" is protected only exceptionally, due to its completeness and indivisibility, typically when it concerns inheritance. In other cases, the issue pertains to parts of property, which, although indivisible, are referred to as "property," "assets," or "property rights," as components of property. In its practice, the Court defines the scope of protection not by referring to the entire property (in the sense of the classical theory), but most often, or always, to "property." While it is true that the terms "property," "assets," and "property rights" are synonyms in the Serbian language, there are significant nuances.

The legal system, which strives for mathematical accuracy, should respect these distinctions, especially considering the need for harmony with the terminology and theory of continental law in EU countries, in accordance with their historically established distinctions and expressions. The next question that arises is whether to use the term "property" or "property rights." The term "property" can be used because it is complete and divisible; it includes the entire estate and can also refer to a specific property, for example, property in one location, along with all accompanying legal and real rights, such as ownership, lease, state property, pledge, easement, etc. The expression "property rights" or "property law" is legally elegant and addresses the issue of the indivisibility of property in accordance with classical theory. However, when it is necessary to express a set of rights, such as those connected with a business, it is more elegant and precise to use the term "property." Finally, in view of the above, the conclusion is to use the term "property" in the second part of the translation of Protocol 1. It is possible to use the term "property" in the first sentence of Protocol 1 and "possessions" in the second, especially since different expressions are used by France, Germany, and England.

For example:

Article 1

Property protection

Every natural and legal person has the right to the unhindered enjoyment of their property. No one can be deprived of their "possessions" (assets, estate) except in the public interest and under conditions provided by law and general principles of international law. The preceding provisions, however, in no way affect the right of the State to apply such laws as it deems necessary to regulate the use of possessions in accordance with the general interest or to ensure the collection of taxes, duties, or penalties. The same terminology was used in official translations, both in English and French. It is necessary to use the term "possessions," or at least "property right." In this context, the use of the term "property" does not align with the classical theory. In the first part of the text, "enjoyment of one's property" includes all of a person's property. In the second part, "No one can be deprived of his possessions" it refers to both the entirety of a person's property and parts of it (which are indivisible). In practice, it will almost always concern a part of the property, where it is more elegant and consistent with the classical theory of property to use the term "possessions." Another systemic view of Serbian positive law may help us understand why the translator did not use the term "possessions." If we look at our Constitution (Constitution of the Republic of Serbia 98/2006), Part Two, Human and Minority Rights and Freedoms, Right to Property, Article 58 prescribes:

The peaceful enjoyment of property and other property rights acquired on the basis of the law is guaranteed. The right to property can be taken away or limited only in the public interest established on the basis of the law, with compensation that cannot be lower than the market price. The law can limit the way property is used. Confiscation or restriction of property for the purpose of collecting taxes, other duties, or fines is allowed only in accordance with the law.

In the first sentence of the aforementioned constitutional provision, it states "peaceful enjoyment of property and other property rights," which is consistent with the classical theory of property. However, at the end, as if the drafters of the constitution wanted to be absolutely certain and to emphasize and strengthen the state's right to collect taxes, it states: "Seizure or restriction of property for the purpose of tax collection," regardless of its indivisibility. The term "possessions" or "property rights" is not mentioned here, even though it is referenced in the valid ZOO.

3. LEGAL-PHILOSOPHICAL UNDERSTANDING OF THE PRINCIPLES OF JUSTICE IN THE LEGAL SYSTEM AND PRIVATE INTERNATIONAL LAW

Kindness is reciprocated with kindness, but evil is reciprocated with justice. (Confucius) It seems to me that it is never enough to emphasize the importance of the place and role of the lawyer as an expert and professional, especially regarding possible changes and adjustments in economic and trade dealings with foreign countries. Dostoevsky—through Prince Myshkin in "The Idiot"—is almost right when he criticizes the sciences for teaching everything except the essential. Roman jurists can teach us something. Did they not say that law was created for the sake of man (*cum hominum causa omne ius constitutum sit* – D. I. 1.5.2)? Did they not emphasize that law is a skill or the art of goodness and justice (*ars boni et aequi* – D. I. 1.1, for example), and that legal science has not only human but also divine components (*divinarum atque humanarum rerum scientia* – I. I. 1.1)? Only with such an attitude towards the law can we achieve the transformation that our society faces. (Stanojević 1971, p. 190.) We must be careful with these old terms in the face of our new digitized and robotized era, but everyday life shows us that a kind of renaissance of law, justice, and "the skill or art of kindness and justice" are needed. Law is inherently practical, relating to people, their lives, and interpersonal relations. As the renowned novelist Max Kaser claims, "Justinian's Digests are the most read, the most commented on, and one of the most important books of today's civilization" (Stanojević 1971, p. 182). We should also draw attention to another important fact: conservatism and permanence of rights. The Law of the XII Tables remained valid throughout the existence of the Roman state. Justinian's jurists, a thousand years after the enactment of the Law of the XII Tables, quoted it with respect (Stojčević, 1957, p. 175). Civil codes, such as the French Civil Code, are still valid and applied today as essential elements of order and justice. Therefore, changes in international political relations should not have a fundamental effect on the legal systems of private law. If such changes were to occur, the consequences would not be positive. Our own ZOO (Obligations Act) confirms this thesis; it has been valid both under socialism and today. There are few examples in history—except perhaps in the laws of physics—of such permanence as that found in the institutes of civil and private law, brought to perfection even in Roman times and still valid today. Of course, the law is not absolute. In ancient Rome, new situations were resolved by the praetor, just as the French jurist addressed new situations with skillful interpretation of the Civil Code two hundred years after its adoption. However, we must remain aware of and careful about the traditionalism and longevity of private law. We should not fear objections regarding the formalism of Roman law. "Try to sell a house today and close the deal; in most countries, it would take you a few days. In Rome, you could do it in the blink of an eye" (Stanojević 1971, p. 186). Similarly, while respecting and utilizing the quality and greatness of Roman law, we should reject the objection that it is a slave's law, because it is a law among the free. It is "mostly the law of trade." All this should be kept in mind by a lawyer who is aware of his very important role and who is awaiting the crystallization of the international economic situation, or who will participate in drafting new regulations. If necessary, we will turn to well-known and long-established solutions to protect the farmer's homestead from mortgage and debt, to protect apartments from minor expenses, and, ultimately, to limit the ownership of agricultural land for legal entities to, for example, ten thousand hectares, and for individuals to five hundred hectares. The Banovina of the Kingdom of Yugoslavia had such powers; they set maximum land ownership at approximately one thousand hectares for natural people. Although individuals did not always respect this, it was not irrelevant. This was to prevent a corporation from, for example, buying eighty thousand hectares and monopolizing prices in the country. We need to protect and nurture the order of private law, both domestic and international, and in turn, it will protect us and international private relations. After all, we must adhere to the law, as Article 21 of the ZOO prescribes acting in accordance with good business practices.

The foundation of law lies in permanent values, ethics, and morals. We must reject mere descriptive accounts, statistical expressions, and the concealment of deeper knowledge. Through the legal norms of private law, kindness should be protected both among the good and the violent. It seems that today we cannot draw many final conclusions, as the issues of international trade relations, the introduction of customs duties, and ongoing war conflicts prevent a definitive assessment, understanding, and subsequent harmonization of international trade and economic relations, particularly in the realm of private law. In this work, we cannot delve into moral and sociological topics, such as lay morality, the success of the education of a gentleman and Puritan morality in England, the attempt at moral revival in France, or the creation of the "good man" in Germany. These are not the subjects of this work; they belong to another discourse. However, we can say that we should begin with a narrative and strive to create our own "knight"—to carry out the reintegration of a fragmented human spirit, separated from chaos, and instill a sense of wholeness that will love and serve life, starting from elementary school and continuing through to college. Let us begin our moral revival.

Our lawyers and other professionals working in international private law and international trade must possess a sense of the whole, which will contribute to both domestic and international private law. This sense of the whole, combined with the awareness that people's actions have a series of consequences, is essential. Only in a just system can individuals and states achieve their respective goals. The violation of justice for selfish interests holds no value, and state power must be an ordered power; otherwise, it is merely ordinary power.

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THE ROLE OF STRATEGIC HUMAN RESOURCE MANAGEMENT IN THE SECURITY SYSTEM

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ABSTRACT

In the contemporary security environment, strategic human resource management has emerged as a critical factor in ensuring the efficiency and sustainability of security systems. This paper examines the significance of a strategic approach to the planning, development, and management of personnel within security structures such as the military, police, and intelligence agencies. Particular emphasis is placed on the unique characteristics of the security sector, including stringent selection standards, continuous training, loyalty, and personnel confidentiality. By addressing challenges such as technological advancements, budget constraints, and the need to adapt to modern security threats, the paper underscores the importance of long-term strategic human resource planning. The aim of this study is to demonstrate how effective personnel management directly contributes to enhancing institutional resilience, sustainability, and operational security efficiency.

Keywords: security system, human resources, management, sustainability, strategy

1. INTRODUCTION

In the current socio-political context, security systems face complex challenges stemming from rapid technological changes, geopolitical instability, the rise of transnational threats, and shifts in the labor force. Within such an environment, effective human resource management becomes one of the key determinants of resilience and success for security organizations. Traditional approaches to personnel management are no longer sufficient there is a need for the application of Strategic Human Resource Management (SHRM) principles, which align human potential with the long-term goals of the organization while upholding ethical standards, sustainability, and digital adaptation. Security institutions such as the police, military, and intelligence agencies operate within specific organizational, cultural, and legal frameworks. These unique features require a tailored approach to the strategic planning, development, and implementation of HR policies. This paper aims to explore the challenges and specificities of human resource management within security structures and to identify models of best practice through a comparative analysis of domestic and international security institutions. Special focus is placed on institutional resilience, organizational culture, process digitalization, and the sustainability of human capital. Through case studies, the paper will illustrate different approaches to strategic HR management in systems such as NATO, the FBI, and the Israeli Defense Forces, and compare these practices with those of domestic actors such as the Ministry of Interior of the Republic of Serbia, the Security Information Agency, and the Serbian Armed Forces. The aim is to identify, through scientific analysis and comparison, the key factors contributing to successful strategic human resource management in the security sector and to offer recommendations for improving domestic practices in line with contemporary standards and challenges.

2. THEORETICAL FRAMEWORK

Over the past decade, human resource management (HRM) has undergone significant transformation, evolving from a traditionally administrative and operational function into a strategic one with direct impact on organizational performance and resilience. This change is especially evident in security structures, where human capital not only contributes to efficiency but becomes a pivotal element in maintaining national stability and responding to the complex challenges of the modern world (Brewster et al., 2020; Collings et al., 2021).

2.1 Strategic Human Resource Management (SHRM) vs. Traditional HRM

Strategic Human Resource Management (SHRM) represents a conceptual shift in the management of human potential, where the HR function becomes an active agent in shaping and achieving organizational strategy. While traditional HRM focuses on routine functions such as recruitment, payroll, and administration, SHRM encompasses succession planning, leadership development, organizational transformation, and forecasting of staffing needs (Delery & Roumpi, 2017; Jackson et al., 2021). In the context of security institutions such as the military, police, and intelligence agencies SHRM demands an additional level of sophistication. HR strategies in this sector must be directly aligned with national and global security objectives, including personnel readiness for rapid response to terrorism, cyber-attacks, organized crime, and non-conventional threats (Taneja, 2022). Unlike the reactive nature of traditional HRM, SHRM incorporates predictive mechanisms from early talent identification and systematic education and training to tools for assessing human factor risks (Wright & McMahan, 2020). In security structures, this includes the timely formation of teams specialized in crisis response, cyber defense, or international missions. Psychological factors also play a critical role in this sector. The selection and development of personnel must account for individual resilience, stress tolerance, and capacity for teamwork under pressure. SHRM addresses these through personality assessments, emotional intelligence testing, and evaluations of adaptive capabilities (Saks, 2021).

2.2 Core concepts: sustainability, institutional resilience and workforce development

Three interconnected concepts form the foundation of SHRM in security systems:

- **Sustainability** refers to the organization's ability to use and develop human resources rationally without compromising long-term functionality. In the security sector, this entails balancing staffing capacity with budgetary resources and implementing mechanisms to prevent overload and professional burnout (Boon et al., 2019).
- **Institutional resilience** denotes the organizational capacity to respond to external shocks and internal challenges. Efficient HR systems enable the rapid redeployment of forces, activation of reserve capacities, and continuity of decision-making in crisis situations (Lengnick-Hall et al., 2020).
- **Workforce development** includes continuous education, adaptation to contemporary trends (e.g., digitalization), and the strategic design of career paths. In security contexts, this means investing in skills such as data analysis, intercultural communication, and cybersecurity (Aguinis & Burgi-Tian, 2021).

2.3 Normative foundations and ethical principles in security structures

Security institutions operate within clearly defined legal and normative frameworks that regulate employee behavior, accountability, and professional standards. In addition to laws governing the police, military, and intelligence services, internal regulations and ethical codes play a significant role.

Key ethical values include:

- Loyalty to the state and represented institutions;
- Confidentiality in handling information;
- Impartiality and consistent respect for human rights;
- Integrity, reflected in responsible professional decision-making and conduct.

Within the SHRM model, these values are not merely behavioral guidelines but are actively embedded in recruitment, training, and evaluation processes. Institutionalizing ethics through training, simulations, and procedures fosters a culture of trust and legitimacy (Farndale et al., 2022).

2.4 The role of technology in transforming shrm in the security sector

Recent technological advancements have significantly influenced the evolution of HRM functions across all sectors, particularly in security structures, where new technologies enable more sophisticated personnel management methods. The introduction of digital platforms for selection, evaluation, training, and supervision has increased automation while raising ethical and legal concerns regarding personnel management (Bondarouk & Brewster, 2016; Marler & Parry, 2021).

In the SHRM context, digital transformation entails:

- Utilizing artificial intelligence (AI) to analyze competencies and predict performance;
- Employing knowledge management software in organizations with extensive operational personnel;
- Developing e-learning platforms for fast and flexible training aligned with operational priorities;
- Managing employee data through secure systems that enable strategic planning while ensuring compliance with data protection standards (e.g., GDPR and local regulations).

Security institutions that successfully implement digital HR tools achieve better coordination, greater process transparency, and reduced risk of human error in critical operations. However, digitalization also raises ethical questions: How do we retain the human element in decision-making? How do we balance control with trust? (Strohmeier & Kabst, 2018)

2.5 SHRM and organizational culture in security structures

One of the key functions of SHRM is to shape and preserve organizational culture, particularly in sectors where discipline, trust, and coordination are essential to operational success. In security organizations, culture is not merely a set of values but functions as an informal control system often stronger than formal rules. An effective SHRM model:

- Recognizes the importance of organizational socialization, especially for younger members of Generation Z who hold different value systems (Twenge, 2020);
- Incorporates feedback mechanisms to continuously enhance team cohesion and resilience;
- Encourages proactivity, critical thinking, and adaptability over rigid hierarchical control (Collins & McKinnies, 2022).

When properly cultivated, organizational culture becomes the foundation of system resilience by creating collective awareness of the mission, role, and appropriate response during emergencies. SHRM has the power to direct and reinforce that culture through well-designed training, performance evaluation systems, and role-model leadership. The literature both domestic and international confirms that HRM innovations are not merely technical or procedural advancements, but represent a fundamental paradigm shift in how organizations treat their employees and develop organizational culture.

In this context, the literature review provides a foundation for understanding the challenges and opportunities that innovative approaches bring to contemporary human resource management. Based on the analysis of existing theoretical frameworks and the objectives of this study, the following hypotheses are proposed:

H1: Strategic human resource management in security institutions significantly contributes to institutional resilience during crises.

H2: The application of modern digital tools within SHRM models in security institutions improves the efficiency of selection, training, and evaluation processes.

H3: The integration of ethical values and organizational culture into the SHRM approach positively affects the legitimacy and trust in security institutions.

These hypotheses serve as a basis for further analysis of how a strategic approach to human resource management improves the quality of personnel processes and enhances overall organizational performance within the security system.

3. CHALLENGES AND SPECIFICITIES IN HUMAN RESOURCE MANAGEMENT WITHIN SECURITY STRUCTURES

Human resource management in security institutions is confronted with numerous complexities arising from the distinctive functional role these organizations play in preserving societal stability and national security. Operating in high-risk environments susceptible to rapid and unpredictable changes, these institutions require a high degree of operational readiness, ethical integrity, and employee resilience (Collings, Mellahi, & Cascio, 2019). At the same time, HR management must adapt to contemporary challenges, including accelerated digitalization, demographic shifts in the workforce, and the evolving nature of security threats.

3.1 High selection standards, confidentiality, loyalty, and continuous professionalization

The personnel selection process in security structures must ensure not only the formal competence of candidates but also their psychological and moral suitability for work in highly stressful and often extreme conditions (Vaiman, Collings, & Scullion, 2017). Psychological stability, emotional intelligence, ethical robustness, and the capacity to work effectively in teams under pressure are critical determinants of success in this sector. Accordingly, recruitment and selection involve rigorous procedures, including security screenings, psychological assessments, polygraph examinations, and evaluations of loyalty and confidentiality (Wright & Nishii, 2013). These values form the foundation of institutional trust and are essential for preserving the functional integrity of the organization. Continuous professional development is an integral part of career progression in security institutions, with emphasis not only on technical and tactical skills, but also on leadership, crisis decision-making, intercultural communication, and stress management (Lengnick-Hall, Beck, & Lengnick-Hall, 2011). This approach supports the ongoing modernization of competencies and sustains a high level of organizational readiness in response to the dynamic challenges of the security environment.

3.2 Technological change, budget constraints and complex security threats

The transformation of security challenges in recent years has involved a shift from traditional forms of threat to hybrid, transnational, and digital manifestations of endangerment (Bauman, 2016; Taneja, 2022). This expansion of the threat landscape necessitates a broader range of knowledge and skills among security personnel, including cybersecurity, data analytics, and the application of artificial intelligence in operational processes (Marler & Boudreau, 2017). However, the introduction of modern technologies encounters institutional limitations chiefly budgetary.

Maintaining technical capabilities, digitizing HR functions, and retaining highly qualified personnel all require strategic management of limited resources (Bondarouk & Brewster, 2016). In sectors such as information security, competition with the private sector further complicates the retention of top talent. Despite these challenges, security organizations that successfully integrate digital tools such as knowledge management systems, e-learning platforms, and algorithm-based recruitment demonstrate higher levels of operational efficiency and adaptability (Strohmeier & Kabst, 2018). Therefore, a combination of strategic orientation and innovation in HR policy is essential for responding effectively to the complexity of the contemporary security landscape.

3.3 Psychological pressures and generational challenges

A defining feature of security work lies in the constant exposure to stress, operation in emergency conditions, encounters with fatal outcomes, and the necessity of sustained readiness. These factors contribute to the risk of professional burnout, mental health disorders, and declining motivation unless adequate psychological support systems and organizational resilience mechanisms are in place (Saks, 2021; Aguinis & Burgi-Tian, 2021). Moreover, generational dynamics present additional challenges. Members of Generation Z, increasingly represented in the recruitment of security personnel, bring different expectations regarding flexibility, digital communication, and work-life balance. These expectations often conflict with the entrenched hierarchical and rigid patterns preferred by older generations (Twenge, 2020). An SHRM approach must incorporate strategies for intergenerational learning, mentoring, and adaptability in order to preserve organizational cohesion and motivation. Managing such diversity requires modernized leadership, emotionally intelligent managers, and the implementation of policies that value inclusiveness, participation, and teamwork core elements of contemporary organizational culture in security systems (Farndale, Paauwe, & Boselie, 2022).

4. COMPARATIVE ANALYSIS AND CASE STUDIES

In order to assess the level of development and potential for enhancing strategic human resource management (SHRM) within security structures, this chapter relies on a comparative analysis of selected international and domestic examples. The primary focus is placed on innovative HR practices aimed at improving operational readiness, resilience, and the long-term sustainability of security institutions.

4.1 International examples

4.1.1 The NATO personnel development model

NATO regards personnel development as a key component of interoperability and the strategic readiness of its member states. Initiatives such as the Defence Education Enhancement Programme (DEEP) are designed to build capacity through partnerships and the modernization of educational doctrines (NATO, 2023). Emphasis is placed on leadership, multilateral cooperation, and adaptive skillsets, supported by modern e-learning technologies and simulation-based training scenarios.

4.1.2 The FBI – Application of HR analytics

The Federal Bureau of Investigation (FBI) is recognized as a pioneer in implementing HR analytics within security structures. Through tools such as the Workforce Analytics Framework, the FBI conducts sophisticated analyses of personnel data to forecast risks, optimize training programs, and identify critical talent (U.S. Government Accountability Office, 2021). This approach facilitates timely succession planning and resilience building through objective performance measurement.

4.1.3 Israel Defense Forces (IDF) – Innovations in selection and training

The IDF is renowned for its dynamic and psychologically sophisticated selection methods, particularly within elite units. The model is grounded in the concept of "adaptability under pressure," integrating psychological assessments, simulations, and evaluations of team cohesion (Ben-Shalom et al., 2018). Training programs are characterized by continuous feedback, adaptive learning strategies, and an emphasis on leadership development through practice and mentoring.

4.2 Domestic Examples

4.2.1 Ministry of Interior of the Republic of Serbia (MoI RS) – Recruitment and education

The Ministry of Interior of the Republic of Serbia is one of the most significant security institutions, encompassing police officers, civilian personnel, and specialized units. Recruitment is conducted through strictly standardized procedures, which include security checks, psychological testing, physical fitness assessments, and evaluations of candidates' moral and ethical qualities (MoI, 2023). Special importance is assigned to institutionalized education provided by the Police Academy and the Basic Police Training Centre (COPO), which constitute the foundation of professional development. Nevertheless, the integration of contemporary HR practices—such as personalized training and e-learning systems remains in a gradual phase of implementation. Notable progress has been achieved in the introduction of specialized training in the fields of cybersecurity and digital crime prevention; however, further investments are needed in developing soft skills, leadership capacities, and intercultural communication (Knežević & Pavićević, 2022).

4.2.2 Security Information Agency (BIA) – Strategic personnel development

As a key counterintelligence and security agency, the BIA operates in a highly confidential and dynamic operational environment. Human resource management within the agency is based on the principles of selectivity, long-term discretion, and the strategic preparation of personnel for specific tasks. The role of SHRM in this context is reflected in the systematic identification of talent, multi-tiered security vetting, and in succession planning and internal leadership development. Particular attention is devoted to discreet training models, as well as so-called mission-tailored training approaches designed to meet concrete security challenges. However, limited transparency in evaluation systems and a lack of widely accessible data hinder the application of modern HR analytics tools (Popović, 2021). The introduction of structured development programs, mentoring schemes, and digital knowledge management systems represents a possible direction for improvement.

4.2.3 Serbian Armed Forces – Professionalization and human capital management

In recent years, the Serbian Armed Forces have undergone significant reforms aimed at the professionalization of personnel and the modernization of organizational structures. The SHRM framework in military institutions is centered on a career development system, which includes clearly defined advancement pathways, specialized training programs both domestically and abroad (e.g., in cooperation with NATO's Partnership for Peace programs), and an evaluation system encompassing assessments of personal and professional competencies (Mitrović & Vuković, 2020). One of the key challenges remains the transition from military service to the civilian sector, for which the Serbian Armed Forces are still developing appropriate support models for former personnel during the reintegration process.

Additionally, there is considerable room for improvement in the digitalization of HR processes and the provision of systematic support for stress management and mental health care especially for veterans and personnel engaged in international missions.

4.3 Comparative findings – key differences

To provide a clearer overview of the distinctions between international and domestic security institutions, a comparative table has been constructed evaluating key areas of strategic human resource management. The assessments were assigned based on descriptive analysis, expert sources, and the presented case studies.

Table 1. Comparative assessment of HR practice development

Aspect	International Institutions (Rating 1–5)	Domestic Institutions (Rating 1–5)	Brief Analysis
HR Analytics	✓✓✓✓✓	✓✓	International institutions such as the FBI utilize advanced tools for prediction, selection, and evaluation. In domestic institutions, HR analytics remains in its infancy, with limited application.
Leadership and Mentorship	✓✓✓✓✓	✓✓	NATO and the IDF develop leaders through structured programs and mentorship networks. In Serbia, such programs exist sporadically and lack systemic integration.
Digital Training and E-Learning	✓✓✓✓✓	✓✓✓	E-learning systems and simulations are widely utilized abroad. Domestic institutions are introducing digital training, though with limited application and infrastructure.
Psychological Support and Resilience	✓✓✓✓	✓✓	IDF and NATO maintain developed mechanisms for mental health support. In Serbia, this area is still emerging, often addressed reactively and without institutional backing.
Reintegration into the Civilian Sector	✓✓✓✓	✓✓	Many Western countries have established transition programs for service members. In the domestic context, this issue is only beginning to appear on the agenda, mostly through pilot projects.

Legend – Evaluation Scale (1–5)

- ✓ – No visible initiatives; the area is undeveloped, not even at an initial stage.
- ✓✓ – Initial activities are present but neither systematized nor strategically established.
- ✓✓✓ – Partial implementation; individual initiatives or pilot programs exist.
- ✓✓✓✓ – Systematic implementation in most units; institutional support is present.
- ✓✓✓✓✓ – Highly developed and integrated programs with clearly defined success metrics and evaluation mechanisms.

Chart 1: Comparison of HR practice implementation – Global vs. Serbia

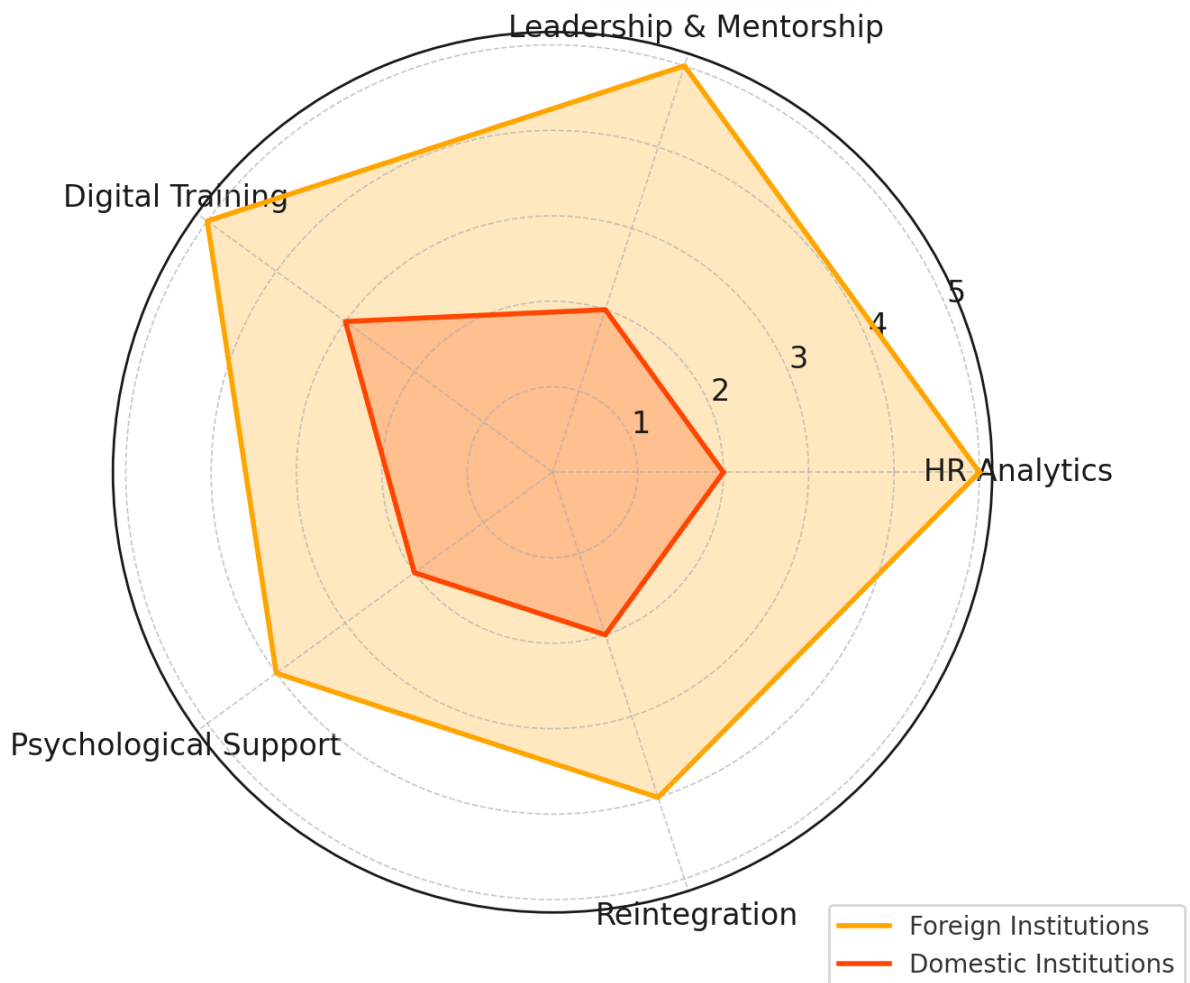


Chart clearly illustrates the differences in the implementation of key HR practices between foreign and domestic security institutions. It is evident that foreign institutions exhibit a higher degree of development across all analyzed areas, while domestic institutions demonstrate particularly low levels in the domains of HR analytics, leadership, and mental health.

4.4 Results and Discussion

4.4.1 Limitations and challenges of domestic institutions

Despite certain advances, domestic security institutions still predominantly rely on traditional HR approaches. The Ministry of the Interior of the Republic of Serbia (MUP) has made progress through specialization of personnel and the development of institutions for basic and advanced police training; however, the digitalization of training and the introduction of adaptive learning are still in the initial stages (MUP, 2023). Additionally, performance evaluations are mostly based on qualitative methods, without the use of advanced HR analytics, which hampers strategic planning. The Security-Information Agency (BIA), due to its closed and highly confidential nature, is limited in the transparency of HR policies, which may reduce opportunities for the introduction of externally validated tools and open developmental programs. Likewise, the Serbian Armed Forces invests in professionalization through career paths and international training, but challenges remain regarding the insufficiently developed support system for psychological health, as well as the slow transition of military personnel to the civilian sector (Mitrović & Vuković, 2020).

4.4.2 Innovations in the Application of Modern HR Practices

Comparative analysis shows that foreign security institutions have significantly advanced in the integration of modern HR technologies, with a particular emphasis on HR analytics, digital training, and personalized development programs. The FBI, through sophisticated tools for predictive personnel analysis, successfully integrates quantitative methods into talent management, enabling proactive decision-making in areas such as training, mobility, and succession (U.S. GAO, 2021). Similarly, the Israeli Defense Forces (IDF) adopt advanced psychometric and simulation methods that enable precise personnel selection with high operational capability and adaptive potential (Ben-Shalom et al., 2018). The NATO model stands out in the field of international cooperation and standardization of educational doctrines, particularly through the DEEP program, which promotes interoperability through the education of military and security personnel (NATO, 2023). This strategy contributes in the long term to collective security and the accelerated transfer of knowledge among member states.

4.4.3 Potential for improvement

Identified challenges in domestic institutions highlight the need for a systemic reform of SHRM processes. The application of HR analytics and digital tools would enable the tracking and analysis of key employee competencies, as well as the creation of flexible development pathways. The introduction of program solutions such as Talent Management Systems (TMS) and Learning Management Systems (LMS) could transform the educational and personnel approach in security systems. Furthermore, leadership must be seen as a key competency not only among senior officers but also at the operational level. Mentorship programs and an organizational culture based on the exchange of experience contribute to long-term stability and efficiency. One of the key findings is the necessity for systemic psychological support. In contrast to foreign institutions, which have clearly defined protocols for burnout prevention and stress management, domestic institutions have yet to establish sustainable and accessible mechanisms in this area. Finally, the reintegration of personnel after service must be a strategic priority, as the lack of such programs often results in the loss of valuable competencies and social marginalization of former members.

4.4.4 Recommendations for improvement

Introduction of HR Analytics and Artificial Intelligence - The application of HR analytics and artificial intelligence (AI) is a critical step toward the professionalization and modernization of human resources in security structures. By utilizing predictive algorithms and big data analysis, institutions can proactively identify candidate profiles with the highest potential for success, both in operational and strategic roles. This enables personalized selection, more accurate succession planning, and a more objective evaluation of employees (Marler & Boudreau, 2017). Additionally, AI tools can help identify the risks of personnel turnover, analyze employee satisfaction factors, and optimize internal training and development processes. This technological foundation allows for faster, evidence-based decision-making, thereby increasing operational efficiency and institutional resilience.

Leadership Development through Continuous Education - Leadership development is essential for maintaining the functionality and authority of security systems. Introducing modular educational programs focused on leadership skills enables systematic building of professional authority, emotional intelligence, strategic thinking, and communication abilities. These programs should be tailored to different levels of hierarchy ranging from operational to managerial personnel to foster a culture of continuous learning and responsible leadership.

Mentorship approaches, based on the transfer of knowledge from more experienced employees, contribute to the stabilization of organizational knowledge, improvement of intergenerational cooperation, and strengthening of employee cohesion. Special emphasis should be placed on developing female leaders and members of vulnerable groups to enhance inclusivity and representation within security structures.

Stress and Mental Health Management - The security sector is exposed to high levels of stress, operational pressure, and emotional exhaustion, which can lead to burnout syndrome, depression, and even professional dysfunction. Incorporating structured psychological support into everyday work processes is becoming a necessity rather than a privilege. This includes the availability of counseling, crisis teams, and resilience training, which help employees maintain psychological balance in high-risk environments (Ivandečić & Mirković, 2023). Additionally, training leaders to recognize symptoms of psychological strain in their colleagues and react proactively contributes to the humanization of the work environment. In the long term, such measures not only protect mental health but also enhance overall operational readiness and reduce costs associated with absenteeism, mistakes, and employee turnover.

Support for Personnel Transition After Service - The period following the completion of service represents a particularly sensitive transitional moment for former members of security structures. The introduction of institutionalized reintegration programs, including career counseling, psychological support, and systematic retraining, represents best practices recognized in international frameworks (OECD, 2021).

These programs contribute to social stability, economic security, and the preservation of veterans' dignity. Additionally, reintegrated personnel can become a valuable resource in civilian structures, particularly in areas such as security, crisis management, education, and advisory services. Active collaboration between government institutions, the labor market, and civil society organizations is crucial for the successful implementation of these policies.

5. CONCLUSION

In an era when security challenges are transforming from conventional to hybrid, digital, and transnational threats, strategic human resource management (SHRM) ceases to be an operational option and becomes a strategic necessity. Human capital is no longer merely a means to accomplish operational tasks it is the foundation of institutional resilience, organizational flexibility, and long-term security stability. This paper has shown that SHRM in security structures must be proactive, data-driven, and value-based. The comparative analysis of foreign and domestic examples has highlighted the gap between traditional, reactive personnel approaches and advanced management models that integrate digital solutions, empathetic leadership, and systemic attention to employee mental health. Institutions like the FBI and IDF already apply tools that enable performance prediction, stress management, and personalized education, while domestic structures are just beginning this modernization journey. Without a paradigm shift in personnel management, domestic security institutions risk stagnation and reduced resilience in confronting crises. The professionalization of the HR function, strengthening leadership at all levels, the implementation of HR analytics, and systemic support for employees are not just reforms but conditions for survival and relevance in the modern security environment. Ultimately, only a strategy that treats human resources as strategic capital not as a cost or technical resource can build a security system that is resilient, responsible, and capable of addressing the complexities of the 21st century. SHRM in the security sector is not merely a management method it is a manifestation of institutional vision, ethics, and strength.

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POLICE SURVEILLANCE UNDER THE DRAFT INTERNAL AFFAIRS LAW: FULL ENVIRONMENTAL SURVEILLANCE-GENERAL SUSPICION OF CITIZENS OR SUSPECTS

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ABSTRACT

From the draft of the Law on Internal Affairs, we can recognize the intention of future changes in the work of the police, the introduction and granting of the authority to conduct complete environmental monitoring of the area and citizens. The draft points to the conclusion that the institution of general suspicion is being introduced for a non-distorted delict. From the draft of the law, it is not possible to recognize which commitment the proposer is advocating: for the architecture of exposing lies, truths, consciousness, suspicious, suspected or less visible flattering truths about the citizens in the environment. On the other hand, it cannot be understood from the intentions of the law writer, whether he, with the intention of complete observation of places, subjects and objects, goes in the direction of criminal phenomenology which is built by criminal morphology and criminography, observing the behavior of participants in public and private life in the phase of non-criminal activities of citizens, in order to collect material for the possible needs of possible future pre-criminal and criminal proceedings. Observations regarding the application of surveillance to non-distorted torts introducing general suspicion as the right of the police to surveil anyone in a public space indicate the complexity of general suspicion as a concept, which requires examination from different perspectives using a range of methodologies and theoretical and conceptual frameworks. The research results presented in this paper seek to explore the ways in which general suspicion enters into dialogue with the general surveillance of rooms and spaces. The research will offer answers, should the implementation of the institute of general or total police surveillance require the police to have grounds to suspect certain crimes before starting a repressive measure of surveillance of persons in a public place? Is general (total) suspicion the basis for the police to conduct a general ambient surveillance of things, persons and spaces (streets, etc.) or is it necessary to require reasonable suspicion in connection with a specific crime or specific criminal activity? The paper offers consideration of the aforementioned controversial issues related to the suspicion arising from the ambiguous status of this institute in the Draft Law on Internal Affairs, and believes that the aforementioned approach introduces a general suspicion of criminal activity of all persons in the public space. Valid standards worldwide in police work and surveillance of citizens in public spaces are that the officer must have basic suspicion...that criminal activity may be ongoing. Such suspicion by the police must be based on specific and articulated facts and rational conclusions drawn from those facts, otherwise everything else would cause intrusions into constitutionally guaranteed rights based on nothing else than unarticulated operations, or it is believed confirmed by nothing, that the territory of Serbia is an area of constant high level of crime.

The research results indicate that the general/total ambient observation of citizens based on formless general/total ambient suspicion is not the practice and achievement of enlightened nations and states in the third millennium. Based on the monitoring in the testing phase of the model of general/total ambient monitoring of space, things and citizens, in which the police could not determine suspected crimes, and required monitoring, in the measurement period it was at the level of 98% or even 99% - only in individual cases did that level reach 7%. During the testing period of the aforementioned model, the police in a number of countries attempted to base their request for general/total suspicion on the so-called secret movement or presence in an area with a high level of crime, which does not suggest suspicion of the existence of any criminal offense. This paper is intended to complement, not hinder, these efforts. The results of the research establish that the legislator and proposer of the Draft Law on Internal Affairs does not have answers to key questions for the establishment of such a repressive institute, such as: why, whom, when, where, and for whom does he want to establish it?

Keywords: Citizen, Draft law, Environmental surveillance, General suspicion, Internal affairs, Police surveillance, Suspect.

1. INTRODUCTION

All states aspire to power over their citizens (Gilley, 2009). All police forces seek state authority ... and also strive to be at the top, in the hierarchy of state branches (Dubber, 2005). It is not uncommon to hear (from its representatives at the top) the claim that it—the police—regulates the most vital interests [of the people] with supremacy over all other mechanisms of social control. Most of these claims are unfounded. Even when it is effective, it will often not be justified, because legitimacy is not among the conditions for the existence of a state. However, here we should mention a famous argument that notes that “belief in its legitimacy tends to increase its (system, state) stability and effectiveness” (Green, 1996). The key question is therefore under what circumstances, if any, are such beliefs justified? First, the theory argues that all modern states aspire to authority, and that this makes them different from bandits or (to simplify matters) hostage-takers (Bottoms, Tankebe, 2017). Hostage takers have power over their captives, but that power is exercised only by force or the threat of force (Miller, 2019). The point of the comparison is precisely that modern states claim something more than this bare power; they claim (note the normative language) that they have the right to rule. Accordingly, Herbert Hart’s famous distinction between the state and the gunman, those who are held in slavery by the gunman, e.g. hostages, feel obligated to obey him. In the case of the state, it is different—the state’s claim to exercise authority, if substantiated, results in citizens feeling obligated to obey those in power (Hart, Green, 2012). Second, it is argued that even a state that has taken over its subjects, and maintains an effective government, is not necessarily legitimate, because effectiveness in itself does not guarantee legitimacy (Murphy, 1999). The state, and thus the police as its organ, will only be legitimate if its claim to authority is justified (Dagger, 2018; Schaar, 1981). The state and the police are legitimate only if they respect the rights of their citizens (Tankebe, 2013; Tankebe, 2014; Kubaienko, et al., 2021). From the aspect of introducing general suspicion as the basis for establishing police total ambient surveillance over: space, rooms, things and objects, it naturally raises the question of what is meant by justification in this context; and this is a point to which we must return in the research. Third, the literature draws attention to Max Weber's argument that "if citizens believe that the state is legitimate, the police are legitimate, and the stability of the state and the effectiveness of the police will be significant" (Weber, 1978). For the research, the basic or key element is the debate between Green, who supports Weber, but later criticizes him under the influence of Bentham's understanding of the legitimation of power, as inadequate in the part of the concept of justification that plays a key role in police work (Green, 1996; Beetham, 2013). Thinking about the concept of justification will also require further consideration in the paper.

We will address some of these theoretical issues of legitimacy and justification as standards for general suspicion for the initiation of total environmental surveillance and the theoretical-empirical focus of surveillance, its establishment and enforcement by the police. The draft of the new Law on Internal Affairs in the Republic of Serbia intends to prescribe general police surveillance of citizens. The proposed provisions in Article 92 stipulate that "In performing police duties, the Police shall use an audio and video surveillance system in a public place, which shall conduct surveillance, video-audio recording and photographing of persons, objects and events, recognition of vehicle license plates and detection of violations. The police are obliged to post a notice on the use of audio and video surveillance systems when conducting surveillance and recording in a public place. If they do not post a notice on the use of audio and video surveillance systems in a public place, the police are obliged to publicly announce their intention to use the audio and video surveillance system. The data collected are stored on the audio and video surveillance system for a maximum of 30 days, and their further processing is carried out for the purposes specified in the law governing data processing in the field of internal affairs. The police may use the audio and video surveillance system of other state bodies, bodies of autonomous provinces and local self-government units, organizations and legal entities. The manner of using the notification of the intention to use the audio and video surveillance system is prescribed by the Ministry. The proposal itself clearly indicates the introduction of the institute of general suspicion and the method of total ambient surveillance: persons, things and spaces of unlimited scale, unknown to civilized and enlightened communities in the third millennium. From a legal perspective, it can be stated that the strength of suspicion in the proposer's intention is influenced by many facts, decisions and motives through the historical perspective of police abuse for political purposes by the authorities and political parties in Serbia. From the above, it can be recognized that the subject of research in this paper is the introduction of general environmental surveillance based on general suspicion. The aim is to demonstrate the scientific viewpoints on police total environmental surveillance through research of existing scientific and literary materials. In this direction, the research hypothesis was determined, which indicates that the proposal to introduce total environmental surveillance based on general suspicion has no basis in scientific literature. The question of suspicion for the establishment of police total environmental surveillance and its understanding is one of the central topics of contemporary scientific discussions in law, criminology and security. This is, in our opinion, primarily due to the fact that national procedural legislation contains a significant number of gaps and ambiguous formulations that lead to additional interpretation of these and other norms during their application. It should be noted that suspicion may or may not, according to existing positive legal acts, be a change in anyone's legal status, e.g. a person with the possibility of legally restricting his rights, freedoms and legitimate interests. Therefore, let us note that the "notification of suspicion" is not present in our legislation. We do not talk about "grounds for suspicion", "reasonable suspicion", "sufficiency of evidence" and the like, which complicates the process we are investigating here: police total environmental surveillance. The problem of misunderstanding the procedure for issuing such a notification, which is due to the lack of precision in the formulation of criminal procedure rules by the legislator, is undoubtedly relevant in practice. In connection with the above, it is necessary to take into account the legal positions that regulate the procedure for informing a person of suspicion. However, the analysis of controversial issues of defining and applying the norms of national legislation and the critical assessment of legal positions requires further active intellectual activity related to research and searching for possible ways to improve the notification of persons about suspicion. A review of the Criminal Procedure Code reveals that it does not contain a specific definition of a notification of suspicion. Also, a review of the Law on Police and the proposed Draft Law on Internal Affairs does not provide a specific definition of a notification of suspicion, but only a notification that a recording will be conducted.

It can be established that it does not recognize either the aforementioned institute (it recognizes grounds for suspicion, which is a procedural level in pre-trial proceedings...), or any act on it. On the other hand, a notification of suspicion is a system of partly procedural, and partly police actions and decisions made by an investigator (police officer) within the framework of investigating a public space by applying surveillance in a public space over: persons, objects and things. Based on the above, the basic hypothetical assumption from which the research started has a watershed with two parallel streams, the first stream is that the legislator and proposer of the Draft Law on Internal Affairs is not credible to be the body that will implement it. The second stream is that the legislator and proposer does not provide answers to the key questions: why, who, when, where, and for whom, which made the draft proposal incredible and unreasonable, in order to introduce such a repressive institute as general surveillance into the function and authority of the police. In the research, we will try to provide answers to the questions that have been asked.

2. GENERAL SUSPICION— SUSPECT— GROUNDS OF SUSPICION: THEORETICAL APPROACHES

In considering doubt, we find the view that doubt as a phrase was coined by Paul Ricoeur to capture the common spirit that permeates the writings of Freud and Nietzsche (Ricoeur, Paul, 1970, 352). Ricker believes that "the writers share a commitment to exposing the lies and illusions of consciousness, believing that they are the architects of a distinctly modern style of interpretation that bypasses obvious or self-evident meanings in order to extract less visible and less flattering truths." (Ricoeur, Paul, 1970, 356). When considering doubt in law, it is suggested that it is not only an intellectual exercise in demystification, but also a critical style and scientific sensibility that offers specific revelations (Felski, 2011). This approach involves several aspects of doubt (Gross, Levitt, 1997), such as the aesthetic and ethical creation of plots in the style of detective fiction, or the observation of events in the environment at the level of interpreting clues, establishing cause-and-effect relationships, and identifying the crime and the victim (Bright, 2015). The aim of the research, therefore, is not to criticize and be suspicious of doubt, but instead to try to understand and take doubt 'seriously', why it has proven so attractive to legal scholars (Berman, 2001)? At the same time, it suggests that the present-day ubiquity and unpredictability of this critical method—total ambient surveillance by the police (Klauser, 2016), makes the proposal in the Draft, and the boldness of the legislator and proposer, increasingly difficult to maintain—unsustainable. In today's legal studies, the proposed framework for applying police powers to total environmental surveillance—this frame of mind often represents caution, vigilance, and distrust (Zoufal, 2008). The pervasiveness of this mindset also testifies to the increasing pressure of professionalization in the struggle to strengthen academic authority, as police paranoia reveals an incredible ability to reproduce itself indefinitely by taking on different hosts — the accusation by representatives of the security system (police) of others for paranoia is itself a paranoid move (Cook, et al., 2005). However, the paranoia of the security system regarding the occurrence of security threats without a concrete material basis (without a basis for suspicion) as a basis for establishing total environmental surveillance based on general suspicion, in the opinion of many theorists, proves a particularly useless concept (Monteleone, 2010). Before we elaborate on the differences between these concepts as a formal police basis for establishing total ambient surveillance in public space, it is important to ask ourselves what they have in common? Suspicion and distrust refer to the tension between the subject and that which is suspected, distrusted (Rohrer, 2024). It is important to note that it says tension, not rupture, because an untrustworthy or suspicious relationship has an essence, which can be productive or destructive (Pelkmans, 2018). Do we "want to establish an omniscient friend by introducing general suspicion as the basis for the application and implementation of total environmental surveillance"? (Ellis, et al., 2013)?

One of the authors, Shand, believes that doubt originally had a biological function – a kind of “vigilance, even fear.” (Shand, 1922, 200), it helped animals to watch out for predators and other dangers, to be on guard. Shand also expresses surprise that “suspicion, as an emotion of such great social importance, has been ignored by legal science, as if it did not exist.” (Shand, 1922, 196). In contrast, skepticism attracted jurists early on, as evidenced by Francis Bacon's essay, “On Doubt of 1625.” (Bacon, 1625, 2023). While the aforementioned authors agree on the negative aspect of suspicion, Shand is particularly concerned about its social effects: “[suspicion] tends to destroy social relations [...] and the more widely it spreads, the more it paralyzes the life of a community which rests on a certain degree of trust among its members.” (Shand, 1922, 196). In other words, suspicion sows the seeds of social discord and contributes to the destruction of the social fabric. Following the above, the question must be asked of the proposer: is he introducing general suspicion in the environment towards unspecified citizens (all) under the suspicion that they have so-called. irregular behavior (Monahan, 2010), which means that the status of a citizen when he leaves his intimate space (apartment, house, etc.) and enters public space, becomes uncertain - he could be both suspicious and innocent. The science of suspicion, as indicated in the literature, developed in the 19th century with the figure of the detective and the emergence of criminology. The detective is a new type of expert (Emsley, Shpayer-Makov, 2006). Relying on his own observation, and sometimes on forensic details, he can decipher signs of criminal activity and translate them into clues, which leads to the identification and arrest of criminals. Modern legal systems are still based on distrust, assuming dishonest acts, false testimony and covert crimes. “Suspicion permeates the practice of law,” as Felski believes. (Felski, 2015). A suspicious observer searches for signs or clues through total surveillance of public space, moving from effect to identification of cause, from observation to explanation – like a traditional hunter who deciphers and interprets clues. (Butler, 2023). We believe that suspicion, from the beginning, plays a key role in considering the total surveillance of citizens, things, objects and spaces.

However, the question must be asked here what kind of suspicion (Lyon, 2001)? We assume that here is the level of suspicion called “grounds of suspicion”, and that general suspicion cannot be considered even as a stage in the chain as a precursor to establishing total police environmental surveillance (Mukhopadhyay, 1997). In order to understand the need for total surveillance to be based on concrete-materialized suspicion, let's give some examples when it comes to people in public space (Pierce, et al., 2018). Examples of suspicious activities or behaviors may include: wandering, appearing nervous and looking over one's shoulder, entering restricted areas when not authorized, attempting to hide an object, using a device to peek into windows, sitting in a vehicle for an extended period of time, sudden changes in behavior, dressing inappropriately for the weather or occasion (wearing a coat when the temperature is high, etc.), leaving packages, bags, or other items behind, exhibiting unusual mental or physical symptoms, unusual noises such as screaming, yelling, gunshots, or breaking glass, individuals in a heated argument, yelling, or cursing at each other (Strowick, 2005). Interpretation of the above routines or deviations from routines may indicate the next phase of behavior that may entail the appearance of a future threat to security, but there is not a sufficient material basis to establish formal legal total environmental surveillance over them (Sunstein, 2002). We would say that the Draft should offer a solution, to move from general doubt to certainty or at least grounds for doubt, in order to establish and implement the institute of total environmental surveillance. We notice that under general suspicion, a multitude of conspiracies of all kinds can develop, this is undoubtedly a new age of general suspicion, or the introduction of a dark age of general suspicion in which information will be replaced by disinformation, and fake news will prevail - which will cause even more general suspicion.

The findings presented indicate that general suspicion is a complex concept, and that it is not, as the word suspicion suggests, that in the Draft it does not have the connotation of a suspect - "a suspect is a person against whom, due to the existence of grounds for suspicion that he has committed a criminal offense, the competent authority in the pre-investigation procedure has taken action prescribed by this Code and a person against whom an investigation is being conducted;" as prescribed in the Criminal Procedure Code (2021), but suspicion encompasses deeper meanings in legal, criminalistic, criminological definitions, as can be concluded from the findings presented in the paper (Inbau, et al., 2013). What is crucial, and not recognized in the Draft, is the way in which the future law intends to empower the police and other officials to conduct total ambient surveillance, and how it will articulate the standards of suspicion, i.e. the nature and degree of justification required for entering legally protected areas of freedom and privacy in public space? As one might conclude, the legislator does not pay attention to this. They are applied both *ex ante* by the police with the issuance of a warrant and *ex post* by the courts of review. We would advocate for several standards of suspicion to be used in the Draft, and later in the Law: reasonable and probable grounds, reasonable suspicion and reasonableness.

We advocate for greater reliance on quantitative metrics in defining and applying the thresholds of the standards of general suspicion and suspicion, and a reference to the probability of occurrence of security threats, with a call for increased recognition of individualization that is similarly limited by the probability of justified mass surveillance. Let us proceed in order, offering the following scale: in the Draft standards of suspicion that can be articulated in countless ways, to begin with, the question is how many? Theoretically, we could use an infinite number, each of which is adapted to the current situation. Alternatively (but with similar effect) there could be a flexible general standard, such as: the first standard is general suspicion based on reasonableness; the second standard could be general suspicion based on probable grounds; the third standard could be general suspicion based on a threshold of probability. Each standard should describe the level of confidence in the presumed outcome (e.g., a particular crime is being committed in a particular area, the probability is very high in the application of surveillance—that evidence of the crime will be found at the surveillance site) that is necessary for police surveillance to be lawful. When considering the stated probability of police entry into public space: persons, things, objects, and space, the police must provide assurance that: (1) the police were (subjectively) sufficiently confident; (2) that their confidence was (objectively) reasonable; and (3) in the event of a review of the aforementioned elements, the police must be able to (show) evidence that they acted with due respect—whether the application of the standard of general suspicion used (that they changed the relevant standard) was reasonable (Bottoms, Tankebe, 2017)?

Furthermore, the threshold of probability of the standard should be higher when the concern for liberty is greater than the interests of law enforcement and vice versa (Hurd, 2002). Probability thresholds can be expressed with varying degrees of precision. This variability can be described by two binary variables. First, the standard can be defined either qualitatively or quantitatively, governing all police incursions of general suspicion and total surveillance into the public sphere as outlined. Second, we propose that everything can be fixed or shifting. A quantitative standard is one that is associated with a broadly agreed-upon numerical value or range (e.g., the occurrence of a threat in a public space), even if it also has a qualitative label. In contrast, a qualitative standard is expressed only in words—it cannot be reliably associated with a numerical value or range. A fixed standard maintains the same probability threshold regardless of case-specific circumstances that might otherwise shift it up or down.

It follows that a change in the standard can be adjusted. In the case of a shift in the standard, the police can take into account circumstances that affect the relative weight of the interest in conducting total ambient surveillance based on one of the standards, taking into account laws and freedoms (such as the intrusiveness and seriousness of the crime). If standards are fixed, the facts of the occurrence of a threat in a public space are irrelevant. Any combination of these variables is possible. A standard could be defined as a fixed, numerical expression of probability, a numerical range of probabilities, or a purely qualitative expression (e.g., reasonable and probable reasons) that is understood or applied as fixed or variable (Keynes, 2013). Third, many lawyers fear that police reliance on these grounds inflates the actual probability of crime and causes social harm beyond optimal prediction. We believe that this is a grossly overstated and untenable view, and that adherence to the high-probability profiling rule can bring any standard of general suspicion into the realm of reason and trust: it may be sufficient for the police to show that the likelihood of crime exceeds the required quantum, and that the grounds for general suspicion are linked to a sufficiently discrete target: for example, suppose that police in crime operation "A" use covert survey data to determine a 60% probability of finding a psychoactive substance (drug) in any given student residence setting. Crime operation "B"—the police (unaware of the statistical information from operation "A") receive a partially confirmed tip that drugs are in the trunk outside. Suppose that this information is no more or less reliable than the statistical conclusions from operation "A".

For both operations, the chances of detecting drugs in a dockside dump are 6 in 10, which is almost certainly higher than the probability basis. But if individualization is required, the police will be able to initiate a search of the premises in operation "A", but in operation "B", they cannot apply surveillance in the public space. So, we note that the standards could be viewed in two ways: as operational-interventional knowledge and operational-instructive knowledge (Danilović, Manojlović, Gajić, 2023) as a basis for establishing and initiating surveillance in public spaces without a court order. From the above, it is determined that general suspicion (not a basis for suspicion, does not designate a suspect or suspect) which is recognized in the Draft, as a legal institute, is not acceptable for initiating police total environmental surveillance, without the standards we have presented, because as we have concluded, it is a "thin thing", so intangible that it is not easy to determine the exact moment of its birth, in order to be the basis for initiating a police operation of total surveillance: persons, things and space. The findings made show that general suspicion must have a reasonable and probable basis of standards that contain something more than an assumption. However, despite the findings made and the demonstrated degrees of possible measurements even of probability, it can be concluded that it still poses quite insoluble problems for the police. To conclude, general police suspicion is not based on a basis for suspicion and is therefore a legally "thin" institute regardless of the existence (possibility) of a large number of standards for its application (Penney, 2003).

3. POLICE AUDIO AND VIDEO SURVEILLANCE IN THEORY

Existing literature provides grounds for claiming that in recent theory, science and professional practice, police general or total surveillance of citizens, based on general suspicion (Marzouki, 2007), there remains a road that is not taken, or is taken less often (Fussey, Coaffee, 2012). The tradition of police surveillance to date provides grounds for concluding that it is not only not effective, for example, only up to 7% participate in exposing persons who are wanted by the competent state authorities under applicable legal acts (Barker, 2011). On the other hand, general police surveillance often appears as a synonym for the discredited model of deep environmental interpretation—the persistent search for the hidden true meanings of citizens' intimate burdens—that are significant to non-police users (Schlembach, 2024).

Therefore, for naive experts in this field, what has been called the rise of general police surveillance of citizens, it is argued, signaled a shift away from democratic and human rights-friendly methods and tools in policing, towards the deconstruction of those values (Manning, 2015) — which led to a focus on the surface, not on depth, on structure, and not on meaning, but on interpretation rather than on the analysis of the very phenomenon of security threats in the environment (Loader, Mulcahy, 2003). The idea of general police surveillance based on general suspicion may seem like an unjustified generalization that comes uncomfortably close to an inhospitable environment, where the citizen is a multiple target (Pandey, 2018): target of the authorities; target of a potential perpetrator (Superle, 2004), etc. where general police surveillance does not provide prevention of attacks (it has no proactive role but a repressive one): it cannot separate the intention of the connection: target—perpetrator, in the majority of crimes not only the situational perpetrator (Rich, 2016). Criticism of such approaches-attempts to introduce the aforementioned institute of total police surveillance in public space (Mitchell, 2003), is widely considered synonymous with intellectual rigor, theoretical sophistication, and unyielding opposition to the status quo (Carr, 1992). Criticism of general police surveillance retains the contradictory force of suspicious views towards general surveillance (Goold, 2004). Denial, entangled in a long history of legislation, prohibition, and misconceptions, can seem punitive, arrogant, authoritarian, creepy, or fruitful (John, Maguire, 2019). As a result, defenders of total police surveillance often downplay criticism and other opinions and their or her associations with direct condemnation (Alderson, Alderson, 1998). It is not a criticism of the aforementioned institute, much less a refutation of certain truths, but rather an examination of the assumptions and procedures through which truths about it are established or refuted. The preferred idiom of advocates of total surveillance is to problematize and demonstrate the unfoundedness of beliefs rather than condemn their own mistakes. The role of the criticism presented here is not to condemn, but to try to uncomplicate, not to destroy the ideas of the proponents if they have any, but to expose their construction on which the institute of total surveillance is based on general suspicion. One of the proposed definitions of general police surveillance indicates that it is “close observation, especially of a suspect” (Brayne, 2017). Much surveillance is applied categorically and beyond individuals to places, spaces, networks and categories of persons, and the distinction between individual and other surveillance can be blurred, based on the characteristics of the technology, the data collection process and the nature of the data (Marx, 2002). The envisaged dimensions of general police surveillance in the law highlight the differences between new and traditional surveillance and offer a way to capture the main sources of variation relevant to contemporary social, ethical and political considerations (Lyon, 2003). There is no doubt that these changes in Serbia would bring about major changes in the field of human rights, but nothing significant in the recognition and prevention of criminal activities. However, the normative implications of this are mixed and depend on the technology in question and the evaluation framework. As can be understood, the law offers/introduces the concept of laxity of surveillance. This includes the extent to which the technology is applied, not the absolute amount of surveillance, which is impermissibly indefinite for democratic conceptions of individualism. Furthermore, the above points to the difficulty in drawing simple conclusions about whether the protection of personal data is reduced or increased in the proposed legal solutions? That police officers are suspicious of certain areas or individuals in public spaces is not new and it is not a fundamental limitation of the rule of law (Mitchell, 2003). The clearest statements in the literature regarding the unfoundedness of total surveillance based on general suspicion (Steyerl, 2011), not only do they point to the need/requirement of the specificity of the crime and state that the purpose of a probable cause request as a basis for surveillance in a public space must be kept within the constitutionally protected areas, until there is reason to believe that a specific crime has been committed (Pantazis, Pemberton, 2009).

Many authors believe that in order to establish general surveillance (monitoring) by the police of public spaces, modern cases require officers to show probable cause to suspect a specific crime (Levinson-Waldman, 2016), or that they are capable of objectively reconstructing facts from the environment in public space (Parkinson, 2012). Until the mid-1970s, the police did not consider this constitutional requirement to be universally applicable. Furthermore, it is held that it is impermissible to base total surveillance on and implement it on the basis of previous arrests or other police operations in a particular public space or to take it as a basis for general suspicion (Blitz, 2003). It is particularly pointed out that it is not sufficient for the basis for establishing total surveillance to be based on general suspicion derived from police records of persons arrested as suspects in a certain area (Joh, 2016). The constitutional status of the requirement for specificity of surveillance in a public space indicates that an officer who wishes to conduct surveillance of a public space must have a reasonable suspicion . . . that criminal activity “may be in progress” (Mitchell, 2003). Let's consider: What does it mean to suspect criminal activity? From the results of research in the literature, it can be understood that to suspect criminal activity should be understood as suspicion of a specific crime - a precisely defined crime (Maguire, 2012; Packer, 1964). So, here we can notice that this is not present even in cases that are narrowly focused on the nuances of reasonable suspicion. General police suspicion as a basis for introducing and initiating total surveillance in public space, cannot be based on suspicion of the so-called illegal work of a person (Norris, 2005). The initiation of total police surveillance in a public place: of things, persons and spaces, cannot begin with a kind of formless, unguided suspicion (Gouldin, 2022). The police cannot monitor based solely on general suspicion, street suspicion, based solely on the street (Fagan, et al., 2016). From the point of view of the legislator, the Draft notes that general suspicion is common, which is more than wrong and legally completely unacceptable. The police must not believe, nor can they be authorized to believe, that they are authorized to monitor individuals in public spaces due to general suspicion without applying its standards (Joh, 2016). Requiring suspicion of a crime in order to initiate total police surveillance, while introducing general suspicion based on its standards, is the foundation of a legally enlightened society (Coleman, McCahill, 2010). The legislator's advocacy that total surveillance be based on general suspicion—less than probable cause—should be permitted only when the police can specify what they think is happening and emphasizing that total surveillance is based on the perceived inevitability of a particular crime occurring (Slobogin, 2008). In making the same argument, we believe that [it is] a matter of constitutional law, that surveillance must return to its roots, and that police who wish to conduct total surveillance cannot do so on the basis of general suspicion, but must precisely state what standard of suspicion they are applying, and have facts to support it (Levinson-Waldman, 2016). In almost every case of attempts to introduce total police surveillance based on general suspicion, science argues, based on a series of supporting facts, that police surveillance itself is a constitutional category that infringes on the human rights of citizens (Franks, 2016). In international aspects of the review—the demand for total police surveillance based on general suspicion has lost its stronghold (Levine, 2016), and it can be noted that the struggle with such cases of general suspicion is still ongoing (Coleman, McCahill, 2010; Maguire, John, 1996). Meeting the conditions defined for a specific criminal offense would not narrow the universe of permissible police surveillance operations that already have their basis in existing laws (Miller, 2014). Requiring proof of a police move towards total surveillance also raises the question of whether the police must specify the object, subject and area of the search before initiating it (Capers, 2017)? From the analysis of the solution offered in the Draft Law on Internal Affairs, it can be understood, first of all, that a seemingly resourceful legal cover has been made, that the legislator's path is aimed at "dragging a net over the police surveillance program in order to attract as little or as little attention from experts as possible" (Manes, 2019; Brayne, 2017).

Closely analyzing the way in which evidence supporting probable cause is assessed in general suspicion for the purposes of total surveillance, and highlighting the variation in definitions of probable cause, has no basis in so-called constitutional reasonableness (Taslitz, 2010), because the prevailing opinion is on the side that points to the senseless humiliation of citizens in public space (Lerner, 2002). Why probable cause is important to constrain general suspicion in total surveillance, and why its absence should be concerned (Lyon, 2001)? The meaning of individualized suspicion, as a basic postulate in liability, and the definition of individualized suspicion in relation to probable cause and reasonable suspicion in general surveillance based on general suspicion, are issues that legal historians touch upon, but do not fully explore (Zillmann, 2014). The requirement of special suspicion would have to have a fundamental impact, otherwise police officers can easily conjure up a crime in general total surveillance, in order to justify their behavior (Capers, 2012). Police routinely exploit low-quality-of-life violations to conduct unobtrusive searches using recording devices in public spaces (Ord, 2020). It can be observed that the legislator, in implementing his proposal, cannot explain and establish the basis for specific suspicion. On the other hand, the legislator seeks to consider non-criminal explanations for non-normative or non-conforming behavior before escalating a situation that is in a non-criminal state (Cordner, 2023), assuming without foundation, that it exists. The cases of general suspicion at issue here are often low stakes from a crime control perspective, and in the conflict between these important cases there may be a cascading shift of the line away from or towards the application of the institute (Levi, Gilmore, 2002). This issue also has increasing urgency, as new police technologies may require greater clarity on this type of basic not only legal, but also civil (human) issue (Harmon, 2011). There are ongoing debates around the world about general suspicion as a basis for implementing such repressive measures — about how to manage presumed states as a basis for intrusions into the sphere of citizens' privacy (Giroux, 2015), and whether there is a police collective objective ethical (primarily ethical practice that gives grounds to believe that it does not exist... journalists know everything...) (Alderson, 1998) reasonableness, collective knowledge and the doctrine of good faith, so that the knowledge obtained through the application of this institute would be protected from excessively problematic or non-existent ethical principles of police behavior (Prenzler, 2021). The implementation of the aforementioned law, if adopted with the proposed measures of general surveillance, would surpass the Criminal Procedure Code, because it would grow so much and cover so much previously innocent behavior of citizens, that we would reach a state where almost anyone could (can) be arrested for something. Therefore, with the aforementioned norm of general surveillance with the introduction of general suspicion, we would get the most extensive approach to the violation and right to violation of the privacy of citizens in public space. The aforementioned draft law would fall into line, or would have the status of an expansive law on internal affairs. If, in order to conduct a survey of a person, thing or space in a public area (which is equivalent to a search, and with the power of technology, some aspects of a search...), according to the aforementioned norm from the draft law, a police officer does not need probable cause to believe that a crime has occurred. This would, in an unrecorded manner in the law on internal affairs, expand the scope of the criminal procedure code (without it being prescribed therein) to the point where such probable cause (the belief that a crime has been committed) can easily be said (regardless of the absence of grounds) to exist (Fletcher, 1998). The absence of the institute of police discretion that affects the quality of life in public places, the community, and thus the new police authority for general suspicion and total ambient recording (Loftus, 2012), cannot therefore be invoked in some aspects that have elements of violation of public order, such as rules against behavior such as public drinking, walking on the street or unlicensed street vending (Holland, 2015).

The concept of general police surveillance in public space as envisaged by the legislator "the police may..." based on general suspicion in the proposed draft law, as can be understood, tends to rely on the perception of non-normative or non-conforming behavior and the perception of behavior or conditions based not on individuality but on collectivity (Gandhi, et al., 2020), which (it is believed) the legislator can subtly and base on the construction of reasonable suspicion, which is wrong, because this approach of the legislator relies heavily on social psychology, which can lead to bias, of any form (Simon, 2012).

4. COMPARATIVE PRACTICE ON POLICE AUDIO AND VIDEO SURVEILLANCE IN PUBLIC SPACE

Surveillance methodologies that include observation processes, recording techniques and analysis have extensive material and procedural intersections with citizens' rights. Creative police practices use the material qualities of new technologies and examine their application beyond specialist use. In, and for the purpose of, introducing new tools into police work, police practices often obscure the paths of application of new institutes, tools and methods in their work, which often leads to conflicts with citizens. We will begin our look through the lens of comparative practice in the world with a note in the short story by author Louis Paget, 'Private Eye', where it is revealed that the entire physical environment doubles as a comprehensive recording system: "On every wall, every tree, every piece of land people walk, their every action and conversation leaves 'fingerprints' of light and sound waves" (Bauman, 2003). Scientists have learned to 'decipher' these naturally created traces and keep records of people's activities and unite them into a video archive that contains the entire past of each individual (Benjamin, 2006). Police investigations of public space surveillance proceed quite differently from those in our world. Police investigators spend part of their operational time in the projection room, rewinding and forward-winding (traces and records through) the life of each citizen (suspect) (Boltanski, 1999). When they want to get a closer look at you, they can slow down or pause your film—to examine "every expression on your face, every muscle flexion, every breath he/she/it [breathes]" (Brucato, 2016). When curious police officers can learn about the experiences that shaped a person, they can instantly travel back to their childhood (Brighenti, 2010). Even those who are not currently under such a government microscope know that every moment of their lives is preserved for the so-called "invisible audience of the future, namely the police" (Brucato, 2012). The inescapable surveillance that Paget describes in his story resembles that described in another famous science fiction story by George Orwell, how the vision of a technologically transformed future (Brucato, 2014) of a world where science and its achievements, applied in practice, have brought the individual to the brink of extinction of privacy (Brucato, 2015). But unlike the inhabitants of Orwell's imagined world who have to come to terms with a life without their privacy, the inhabitants of the world described by Paget have made an impressive and probably effective effort to avoid it. They have countered the threat posed by exotic technology by inventing a not-so-exotic legal remedy, introducing the rule "...that the monitoring of a person's past can only be undertaken for the purpose of investigating a 'serious crime'—to be introduced into criminal proceedings, and presented at trial, only if [it] has a direct 'connection' to the crime" (Brucato, 2015). Over time, this legal tool has undergone changes and, instead of a direct connection to the crime, it now allows for the use of video surveillance and investigation of a person's past "when necessary to carry out the task of protecting people or arresting those who have harmed them", which is a much more lenient criterion. A growing number of communities around the world are doing this—installing video surveillance in public spaces on a massive scale. The UK has led the way. Cameras now surround central London in a so-called 'ring of steel', photographing the license plates and drivers of every vehicle that enters (Ariel, et al., 2015).

A vast video surveillance system also monitors the inner city. Many other British cities—by one count, at least 440 in total—have also covered entire neighborhoods and business districts with cameras (Chen, et al., 2021). American cities are rapidly following suit. Although most residents and visitors to New York City remain unaware of them, thousands of video cameras, many of which are “indistinguishable from streetlights,” sit above parks and streets throughout the city and on school and university campuses. The city of Baltimore has installed cameras at “all 106 intersections downtown” (Blitz, 2003) and in the Inner Harbor area. Washington, D.C., and its Police Department, operate cameras that monitor downtown streets, the subway, parks, and other public spaces and have plans to significantly expand their video surveillance system in the near future (Welsh and Farrington, 2009; Blitz, 2003; Whyte, 2012). Chicago recently joined the list of major cities that are installing cameras over public streets, and other American cities are doing the same (Bain, et al., 2012). The cameras now proliferating in urban spaces are in many ways far more powerful than the video cameras of the past (Lyon, 2001). Most can rapidly pan, tilt, or rotate 360 degrees at the command of a remote control room (Gates, 2011). They can isolate an individual in a business district or subway station, zoom in, and zoom out, noting that cameras in Washington, D.C. “already monitor public transportation stations, monuments, and schools, and plans are underway to expand surveillance to streets, shopping malls, and neighborhoods, creating what will soon be one of the most comprehensive public surveillance networks in the country” (McCahill, 2013). Washington, D.C. has ‘one of the more sophisticated police camera systems’, that the city police use cameras to monitor public spaces in the city, with the ability to closely examine facial expressions, movements, and even materials to read close-up details (Newell, 2021). These are not isolated units, but components of an integrated network of cameras that send information from many different parts of the city back to a common observation center, which can then analyze the data as a whole or track a person as they move from one part of the city to another (Whyte, 2012).

The digitization of video images and the vast expansion of computer memory have allowed operators to store significant amounts of visual data and retrieve and search this data when they have a request (sometimes spontaneously) to view it (Aghajan, 2009). Investigators in our world have and are applying methods to video surveillance to link images to identities and other information beyond what the camera shows (Blitz, 2003; Finn, 2009). Using facial recognition software, investigators can quickly match a face to a specific name and then (with the help of other databases): medical histories, tax records, arrest records, voting records, political affiliations, and other possibilities and types of information (Perritt, 2020), every life could become not just an electronic ‘open book’, but an ‘open website’, which investigators can use not only to rewind or fast-forward through large parts of history, but also to link a face to extensive data (Martin, 2020) about (and perhaps visual recordings of) that person’s colleagues, the organization they belong to, and various references related to them in their absence (Haber, 2021). Interestingly, one of the oldest surveillance systems in the world, the British one, is not connected in this way (Johnson, 2002). Professional practice suggests that this is likely to change over the next few years, as Britain moves towards the kind of integrated, ‘Web-based’ surveillance system being developed by Visionics [an American facial recognition company] (Blundell, 2020). To conclude the comparative practice, smart cameras are preparing for the security of industries and public spaces, objects, things and people. The cost of cameras is falling, and the bandwidth is increasing. Together with the reduction in the cost of processing power, the physical and legal restrictions on the equipment being ubiquitous are being removed. Of course, the increasing use of cameras and facial recognition software, in itself, condemns us to live in a world where our past can be traced by curious officials (Lyon, 2001).

The vast majority of images recorded by video surveillance cameras of public spaces, objects, things and people will probably be less and less examined by authorized persons or the persons who manage them (Wilburn, et al., 2005). Most images recorded by cameras will probably be forgotten soon after being recorded (Gates, 2011). Facial recognition technology also has to overcome significant hurdles before it can function as an effective mechanism for real-time tracking and identification of people in public places, despite the rapid technological development that is transforming camera systems and facial recognition devices into far more powerful instruments than they once were (Yao, et al., 2012). Finally, we must note that while we do not yet live in Paget's world, we do not have to be a science fiction fan, as mapping expert Marc Monmonier points out (Blitz, 2003), to imagine a future in which cameras are as dense as streetlights—transmitting images to a central computer with facial recognition algorithms and biometric software that link pedestrians to their stored profiles and track their movements through streets and parks, with the constant questions of who, what, where, and why—the activities and people captured on video (Monmonier, 2004). It is argued that the exponential increase in visual surveillance creates a massive and expensive information processing and handling problem, and that tracking individuals remains very limited. (Wayman, et al., 2009) Practitioners argue that, after years of refinement and improvement [after research and testing in the 1980s and 1990s], today's surveillance techniques work best in controlled environments—when crowded conditions are taken into account...system performance degrades (Lamnabhi-Lagarigue, et al., 2017; Zhao, et al., 2003).

Despite the current problems that hinder the use of facial recognition for public surveillance, it is technologically feasible to imagine that in the not-too-distant future, as we walk down city streets, we will not only be photographed, automatically identified, but lip-read (Phillips, et al., 1998). Many practitioners note that the public believes there are good reasons to believe that our legal regime should impose a warrant requirement, or some equivalent legal barrier, between government agencies and the video recording of the daily lives of its citizens (Sarkar, et al., 2005). The professional public asks, “what will institutions do to decipher naturally generated records of people's activities” (Scott, 2014)? Practitioners are skeptical about the effectiveness of video surveillance systems, believing that ‘ordinary’ potential criminals may be deterred from theft or violent crime due to the prospect of being easily identified by the police (Brayne, 2021) (although the evidence on the deterrent power of existing surveillance systems is unclear and questionable) (Goold, 2004). Practitioners base their doubts about the effectiveness of video surveillance systems on the fact that they are ineffective in the fight against suicide bombers, and even less so in the fight against organized crime and drugs, which are significantly more dangerous to society than ordinary crime where the impact of surveillance is unrecognizable (Duggan, Forest, 2021).

5. ANALYSIS AND DISCUSSION

The results of the research show that the provisions of Article 92 of the Draft Law on Internal Affairs do not provide an answer to the question: Why and for whom is surveillance, video-acoustic recording and photography of persons, things, objects, events and public spaces carried out? Detecting violations and recording license plates is not the answer to the previously asked question. Doubt (or skepticism) in the stated approach of the drafters of the Draft Law on Internal Affairs should be at the highest level of incomplete faith or distrust in the proposal. The proposal itself clearly shows the introduction of the most repressive institute of general suspicion, which has not been recorded in this region in legal practice and theory, and the method of total ambient surveillance: persons, things, objects and spaces of unlimited scale, unknown to civilized and enlightened communities in the third millennium.

Based on the above, the research results confirm the watershed in the hypothesis, which shows that the proposers of such a legal act cannot be police officers or the police themselves who will implement it, which is contrary to the practice of democratic and legally enlightened peoples. Furthermore, the findings in the research confirmed the second watershed of the hypothesis, where it was proven that the current legislator of the Draft Law on Internal Affairs did not answer the key questions in the provision of Article 92: why, who, when, where, and for whom to supervise, which made his draft proposal unreasonable and unreliable, in order to introduce such a repressive institute as supervision into the function and authority of the police: persons, things and objects in public space. Furthermore, from the very norm of Article 92, it cannot be understood whether its subject: the subject or object is crime, or whether it is unspecified persons and the entire population: adults, minors, children as a body of citizens, for an unpunished delict? It is not possible to recognize whether the legislator has a preventive approach in mind, and what the subject-object relationship is, what this possible preventive approach would be aimed at, if comparative research shows that the institute itself is repressive. The legislator and the proposer do not provide information on whether the aforementioned repressive institute will study the carriers of signals, messages, the rules of their origin, the assessment of their meaning and in which procedure: pre-criminal or criminal, and for whom is such a knowledge base about citizens intended? Theory and professional practice agree that the introduction of such a repressive institute has not yielded results in reducing the number of committed crimes, nor has it increased the number of discovered and proven cases after the crime has been committed. In particular, it is indicated that the effectiveness of this institute is almost non-existent in terrorist activities and organized crime. On the other hand, it is indicated, and the results of the research confirm this, that social control of citizens for uncommitted crimes has increased to unimaginable proportions, while the number of drug traffickers and the amount of drugs in circulation in cities have not decreased. The above justifiably raises the question: For what purpose is total ambient surveillance carried out based on general suspicion in public space? The Draft Law on Internal Affairs does not offer an answer to this question, which should have been recognizable.

6. CONCLUSION

The proponents of the Draft Law on Internal Affairs, in Article 92 on police surveillance, as can be concluded from the research, did little to explain the standards of suspicion used in the regulatory part of establishing, introducing, prescribing and implementing total ambient surveillance of public space by the police. This is “unfortunately” defined. More can be gained by discussing more precisely and rigorously the characteristics of these standards and their relationship to the objectives and management of the surveillance process based on general suspicion, as shown by the findings of the research. Is the police's encroachment on individual freedom or privacy by conducting total ambient surveillance based on general suspicion without clearly defined standards justified? The answer to this question is given in the research findings, through a scientific task, which, using a built-in metric of the taxonomy of general suspicion standards, provides knowledge to the legislator so that he can assess to what extent the norm offered by the Draft in Article 92 is in line with the norms of consensus and the empirical reality presented in the research findings. By building on the established standards of common suspicion as a basis for initiating and conducting surveillance in public spaces, police can advance their objectives by supplementing their qualitative definitions with numerical ranges of probability. In contrast, greater attention to metrics and individualization will not help police, in the absence of a standard of suspicion, to better address reasonableness. Instead, better decision-making can be achieved by a clear understanding of what, for example, the standard of reasonableness is and when it should be applied. As we have understood from research and findings, standards of common suspicion can be defined negatively and positively.

Negatively, it is an *ex ante* justification for an intrusion that lacks one or both of the features of the other two standards: a defined (and ideally measurable) minimum threshold of probability and a sufficiently discrete target. Positively, it requires intrusions to be consistent with their legally authorized purposes. Understood in this light, standards of common suspicion appear more clearly as a *de facto* justifying standard for a multitude of powers of regulatory police operations in public space surveillance. As can be understood, the scientific community is halfway between for and against the introduction of total surveillance in public space: of persons, objects, things and the space itself, while practitioners are largely on the side of introducing the aforementioned institute in police work. Skepticism is recognized in the extent of the effectiveness of the aforementioned institute in the hands of the police, and whether it is preventive or repressive. The research findings indicate that it can be preventive, but that most of its operations take place in the field of repression after the crime has been committed, which does not make it the most desirable tool for security. The findings recognize that the Draft Law on Internal Affairs in Article 92 approached the definition of surveillance in a public place with a heuristic approach, because surveillance is not limited by a procedural form, has a wide creative space and the possibility of dynamic development in all directions. The mentioned article approaches the public space as a phenomenon of a criminal offense whose characteristics in that space are equally real and legal, which is wrong. It can be concluded that the legislator assumes a criminal offense in public space as a real phenomenon, and that persons moving in public space have committed a certain criminal offense. The general conclusion of the research is that in the form in which the Draft proposes to prescribe the norm in Article 92, it is not immanent to legal achievements, because it does not establish a mutual relationship between form and content, and it represents the essence of every norm, and the procedure that the police would implement by drawing authority from it. From the norm of Article 92 of the Draft itself, it is not clear whether general suspicion in public space, as the legislator introduces it in the form of concealment, is a natural, necessary and legal connection between surveillance in public space and citizens, and should be understood as a basis for surveillance, because the presence of one person in public space will destroy the rights of another person. Furthermore, from the draft of the proposer, it can be understood that the reason for introducing video surveillance in public space is that a citizen becomes a criminal by entering public space. From the above, it can be concluded that, under the proposed norm of Article 92 of the Draft Law on Internal Affairs, police officers have the authority to organize a process to convict an innocent person, if they believe that such a procedure is in the best interest of society, with an unclear definition of which society that is.

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ADAPTIVE LEADERSHIP IN COMPLEX SYSTEMS: MOVING BEYOND BUREAUCRATIC CONSTRAINTS

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ABSTRACT

In increasingly complex dynamic environments, traditional bureaucratic organizations face a fundamental challenge: how to maintain stability while simultaneously developing the capacity for rapid adaptation to emergent changes. This paper explores the role of adaptive leadership in managing complex adaptive systems (CAS) through the lens of Complex Leadership Theory (CLT), focusing on the transformation of bureaucratic structures. Through a critical synthesis of classical and contemporary theories, the paper reveals the essential tension between bureaucratic systems, based on hierarchy and control, and the principles of CLT, which recognize leadership as a distributed, emergent process. The analysis emphasizes how bureaucratic organizations, despite their advantages in stable conditions, become vulnerable in complex environments because of their delayed response to changes and institutional inertia. In contrast, CLT offers a framework in which adaptive leadership acts as a catalyst for organizational transformation, fostering self-organization, collaboration, and innovation through the interactions of multiple actors. The paper illustrates how adaptive leaders, through strategies such as supporting experimentation and tolerance for uncertainty, enable systems to develop dynamically without completely abandoning structural frameworks. In conclusion, the research offers practical guidelines for the application of CLT in bureaucratic organizations, emphasizing the need for a cultural transformation, redistribution of responsibilities, and the development of leaders capable of managing the paradox of "control and creativity." This research contributes to leadership theory by reinterpreting the role of leaders in CAS, highlighting that adaptive leadership is not an alternative to bureaucracy, but a tool for its restructuring under the demands of complexity.

Keywords: *adaptive leadership, complex adaptive systems, Complex Leadership Theory, bureaucratic organizations, organizational adaptation.*

1. INTRODUCTION

Modern organizations operate in an environment characterized by dynamic complexity, where rapid technological advancement, global interdependence, and unpredictable crises (pandemics, climate change) demand new approaches to management. Traditional bureaucratic models, based on hierarchical control and standardization (Weber, 1947), prove inadequate in contexts where flexibility and creativity become key factors for survival. As Stacey (1996) and Heifetz (2009) highlight, organizations face a paradox: rigid structures, designed for stability, stifle the capacity for rapid adaptation and innovation. This problem raises the need for a theoretical framework that goes beyond reductionist models, and it is precisely this role that the theory of complexity plays—a paradigm that explores how CAS generates emergent patterns through nonlinear interactions (Marion, 1999).

According to complexity theory, organizations are CAS of a dynamic nature, where the collective behavior of members (agents) generates unpredictable outcomes. For example, spontaneous collaboration between teams can lead to innovative solutions without direct management intervention (Uhl-Bien & Marion, 2007). This dynamic, however, requires a reconfiguration of traditional leadership approaches. While bureaucracies insist on centralized control, CAS requires adaptive leadership that encourages decentralization, experimentation, and tolerance for failure (Snowden & Boone, 2007; Schein, 2010). As Hamel (2007) emphasizes, the key difference lies in shifting the focus from "managing people" to "creating conditions for self-organization."

The major challenge of contemporary organizations lies in the inability of bureaucratic systems to integrate the principles of CAS. Namely, hierarchical structures inhibit emergent processes such as spontaneous collaboration or rapid learning, resulting in inertia and a loss of competitiveness (Uhl-Bien & Marion, 2007). The COVID-19 pandemic illustrates this dynamic: organizations with flexible structures quickly adopted hybrid work models, compared to bureaucratic institutions, which confirms the advantage of adaptive approaches (McKinsey, 2020). Therefore, a key question arises: How can adaptive leadership, through the lens of complexity theory, transform bureaucratic systems into organizations capable of harnessing emergent creativity? The aim of this review is to analyze the mechanisms of adaptive leadership from the perspective of CLT that enable overcoming the limitations of bureaucracies. Through the synthesis of key concepts of complexity theory (nonlinearity, self-organization, emergence), the paper explores how decentralized decision-making, fostering experimentation, and cultural tolerance for risk can serve as catalysts for organizational transformation.

2. COMPLEX ADAPTIVE SYSTEMS

2.1. Definition and Key Characteristics of CAS

Complexity theory offers a scientific paradigm for studying CAS—entities composed of interconnected elements whose interactions generate nonlinear, unpredictable behaviors. Departing from classical linear models that seek mechanistic cause-effect explanations, complexity theory frames the world as organic and dynamic, characterized by uncertainty and emergent order (Regine & Lewin, 2000). This perspective challenges reductionist approaches, positing that systems are too unstable and interdependent to be reduced to simplistic frameworks (Prigogine, 1997). Schneider and Somers (2006) delineate three pillars of complexity theory: nonlinear dynamics, chaos theory, and adaptation/evolution, which collectively illustrate how CAS navigates instability and innovation.

Nonlinear dynamics, rooted in Prigogine's (1996) work on dissipative structures, reveal how systems far from equilibrium develop through energy exchange with their environment. These systems exhibit inherent instability, which drives transformative transitions to states of higher complexity (Mathews et al., 1999). Central to this process is emergence—the spontaneous generation of system-level phenomena, from agent interactions, irreducible to individual components (Holland, 1998; Eoyang, 2011). Emergence arises from nonlinear feedback loops and interdependencies, resisting linear causality (Cilliers, 2000). Uhl-Bien et al. (2007) expand this concept, linking emergence to adaptive creativity through mechanisms like tension dissipation (Prigogine, 1997), synthetic integration (Kauffman, 1993), and network cascades (Bak, 1996). These processes enable CAS to balance stability and change, fostering innovation while maintaining coherence. Chaos theory complements nonlinear dynamics by emphasizing sensitivity to initial conditions (the butterfly effect) and deterministic chaos—where systems governed by fixed rules exhibit unpredictable trajectories (Lorenz, 1963; Ruelle, 1971).

In contrast, complexity theory focuses on self-organization and emergent order, arising from the interplay of perturbing forces (e.g., innovation, conflict) and stabilizing structures (e.g., institutional frameworks) (Chiles et al., 2004; Thietart & Forgues, 1995). Perturbations push systems into disequilibrium, creating opportunities for adaptation, while stabilizers prevent chaotic collapse. This dialectic mirrors Prigogine and Stengers' (1984) assertion that chaos and order coexist in autocatalytic cycles, where entropy and synergy drive progressive complexity. Self-organization, a cornerstone of complexity theory, explains how CAS adapts through endogenous processes rather than external directives. Systems reorganize spontaneously via dynamic energy and information exchanges, optimizing functionality under shifting conditions (Prigogine & Stengers, 1984). Stacey (1995) underscores nonlinear feedback as the engine of evolutionary change, where agent interactions generate novel strategies. For example, dissipative structures transform chaos into hierarchical order, illustrating how systems leverage instability to achieve emergent states transcending individual capabilities. Complexity theory provides a robust framework for analyzing CAS in organizational contexts, emphasizing nonlinearity, emergence, and self-organization as critical to managing modern challenges. By embracing disequilibrium, fostering decentralized innovation, and balancing stability with adaptability, organizations can cultivate resilience, agility, and sustainable success in volatile environments. This transformation in approach—from mechanistic control to organic coordination—equips leaders to navigate uncertainty by harnessing the inherent creativity of complex systems.

2.2.CAS in the Organizational Context

CAS provides a critical framework for analyzing organizations as dynamic entities characterized by non-linear interactions among heterogeneous agents. This paradigm conceptualizes organizations as intricate networks where sustained interactions among agents—individuals or collectives—foster collective synergy through shared objectives, knowledge, and perspectives (Marion, 1999; Regine & Lewin, 2000). Exogenous pressures (e.g., environmental volatility, regulatory shifts) and endogenous tensions stemming from interdependencies, resource competition, and divergent priorities continually shape these systems. Such tensions propagate through interconnected agents, catalyzing emergent properties—spontaneously arising phenomena like adaptive learning, innovation, and self-organizing mechanisms. Crucially, these emergent behaviors are irreducible to individual intentionality, including formal leadership, and instead arise organically from collective dynamics, enabling decentralized adaptability to navigate uncertainty and drive iterative development (Uhl-Bien & Marion, 2009).

Central to CAS adaptability are four interconnected conditions: dynamic interactions, interdependence, heterogeneity, and adaptive tension. Dynamic interactions, as articulated by Cilliers (1998), involve continuous, non-linear exchanges among agents, blending conflict, collaboration, and reflexivity to generate systemic transformation. These recursive processes allow CAS to transcend static equilibrium, leveraging disequilibrium, to sustain adaptability. Without such dynamism, systems would stagnate into predictability, losing the ability to respond to environmental perturbations. Building on this, interdependence—rooted in shared systemic needs (Marion & Uhl-Bien, 2001)—compels agents to collaborate toward collective objectives, ensuring isolated actions coalesce into coherent adaptive responses. Conversely, heterogeneity—diversity in skills, technologies, and perspectives (Sutton, 2002)—introduces creative disruption. Divergent viewpoints generate cognitive friction, catalyzing non-linear problem-solving. For example, interdisciplinary team conflicts often yield innovative solutions unattainable through homogeneous consensus.

Adaptive tension emerges as the catalytic force bridging these elements. It arises from competing constraints (e.g., resource scarcity, leadership demands) and the imperative to reconfigure relational or structural paradigms (Heifetz & Laurie, 2001). This tension acts as a "creative stressor," driving systems to innovate, learn, or reorganize. Heterogeneity amplifies tension through diversity-driven discord, while dynamic interactions mediate its resolution via collective learning or structural adaptation. Ultimately, the symbiosis of interdependence, heterogeneity, and adaptive tension defines CAS. Interdependence motivates collaborative agency, heterogeneity injects generative instability, and adaptive tension imposes evolutionary pressure, all mediated by dynamic interactions. Together, they form a self-sustaining loop where disorder and order coexist, enabling CAS to navigate complexity through emergent, self-organized resilience. This framework underscores leadership not as centralized control, but as the cultivation of contexts where organic interactions catalyze transformation—a paradigm vital for thriving in volatile socio-organizational landscapes.

2.3. Implications of CAS for Leadership

Understanding modern organizations as CAS requires a shift in leadership theory, moving beyond traditional models rooted in bureaucratic efficiency and hierarchical control. Classical approaches designed for stable environments falter in today's volatile, non-linear business landscapes, where adaptability supersedes predictability as a core organizational imperative (Schreiber & Carley, 2007). This dissonance underscores the critical challenge articulated by Uhl-Bien and Arena (2018): enabling organizations to thrive amid dynamic, often chaotic external pressures by reimagining leadership as a catalyst for systemic adaptability. In contrast to mechanistic, top-down frameworks, complexity-informed leadership redefines the phenomenon as an emergent, distributed process arising from networked interactions among heterogeneous agents (Uhl-Bien et al., 2007). Leadership ceases to be synonymous with formal authority; instead, it manifests through decentralized relational dynamics that stimulate collective innovation and transformation. This perspective aligns with Gronn's (2002) and Osborn et al.'s (2002) emphasis on leadership as a multi-agent activity, where communication patterns and collaborative synergies drive organizational evolution. Central to this reconceptualization are principles of self-organization, emergence, and co-evolution, which position leaders as architects of environments conducive to adaptive learning (Schneider & Somers, 2006). By fostering decentralized decision-making and knowledge-sharing ecosystems, leaders enable emergent problem-solving—processes where novel strategies and practices arise organically from agent interactions rather than top-down mandates. For instance, Surie and Hazy (2006) identify adaptability and innovation as critical competencies for navigating uncertainty, achieved not through directive control, but by nurturing conditions for experimentation and cross-functional collaboration. The efficacy of complexity leadership thus hinges on orchestrating disequilibrium—strategically balancing stability and creative disruption to catalyze systemic resilience (Uhl-Bien et al., 2007). Leaders function as boundary spanners, designing contexts where tensions between competing priorities (e.g., efficiency vs. innovation) generate adaptive energy. This involves cultivating spaces for dissent, interdisciplinary dialogue, and iterative experimentation, allowing organizations to develop through feedback loops and co-evolutionary adjustments. Ultimately, complexity theory reframes leadership as a meta-organizing process where influence spreads across networks, outcomes are non-linear, and transformation emerges from the interplay of diverse agents within fluid, adaptive structures. By transcending individual-centric models, this framework equips organizations to harness chaos as a generative force, positioning leadership not as a role but as a dynamic enabler of systemic vitality.

3. FROM BUREAUCRACY TO CAS: WHY IS CHANGE NECESSARY?

Despite theoretical narratives proclaiming the "death of bureaucracy," empirical evidence reveals its enduring presence. Bureaucratic features—hierarchical control, task specialization, and formalized procedures—persist as foundational elements, particularly when institutionalized over time (Hazy, 2011; Volton, 2005). This durability underscores bureaucracy's structural and symbolic entrenchment, even as modern organizations increasingly face volatile, uncertain environments. Crucially, bureaucracy's design prioritizes efficiency and stability over adaptability (Brown & Eisenhardt, 1997; Eisenhardt & Tabrizi, 1995), a flaw rooted in its rigid architecture. As Weber (1980) conceptualized, bureaucracy formalizes hierarchy and rules to ensure continuity, yet this rigidity inherently limits flexibility and entrenches social inequalities. Vertical hierarchies isolate decision-making at the top, stifling horizontal collaboration and organic innovation (Burns & Stalker, 1961; Diefenbach & Sillince, 2011). Paradoxically, while bureaucracy suppresses informal vertical interactions, informal hierarchies emerge laterally among peers, replicating dominance dynamics through social norms or personal traits (Pasini & Morseli, 2009). These micro-level hierarchies, though unintended, mirror the formal system's logic, further entrenching a culture of control. Such structures create organizational fragility: mechanistic adherence to protocols stifles creativity, leaving systems ill-equipped for rapid adaptation (Stacey, 1996; Weick, 1995). For instance, Hirst et al. (2011) demonstrate that high centralization and formalization suppress individual creativity, which thrives only in decentralized, low-formalization contexts. Similarly, Schneider and Somers (2006) argue that rigid systems "freeze" behavioral patterns, buffering against external change, and diverting resources to maintain the status quo. This tension highlights bureaucracy's fundamental incompatibility with CAS, which prioritizes self-organization, emergent innovation, and distributed learning (Uhl-Bien et al., 2007). Unlike bureaucracies, CAS leverage decentralized interactions to generate adaptive responses, balancing stability with organic flexibility. The bureaucratic obsession with control stifles the spontaneous collaboration and experimentation essential for navigating complexity. For example, excessive procedural standardization limits unconventional problem-solving, while centralized decision-making delays responses to dynamic challenges. The solution lies in reimagining organizational design to harmonize hierarchical discipline with CAS principles. By fostering environments where formal structures coexist with adaptive networks, organizations can mitigate inertia while retaining coherence. This hybrid approach, as advocated by Schneider and Somers (2006), enables systems to develop without sacrificing functionality, transforming rigidity into resilience. Thus, the shift from bureaucracy to CAS is not merely theoretical—it is a pragmatic imperative for survival in an era defined by disruption and nonlinear change.

4. COMPLEX LEADERSHIP THEORY

CLT redefines leadership as a dynamic, emergent phenomenon rooted in the principles of CAS. Departing from traditional hierarchical models, CLT posits that organizational evolution arises not from centralized control, but from distributed interactions among agents within a network (Uhl-Bien & Marion, 2009). Leadership, in this framework, transforms into a non-linear process of self-organization and collective adaptation, where innovation emerges organically through decentralized exchanges of knowledge and resources (Marion & Uhl-Bien, 2001). Central to CLT is the premise that transformative change stems from dynamic interdependencies among individuals, teams, and structures, rather than top-down mandates. Here, leaders assume the role of "architects of conditions," designing environments that foster information flow, synergy, and emergent intelligence, enabling organizations to respond nimbly to transformative challenges (e.g., technological shifts) through distributed problem-solving (Lichtenstein et al., 2006; Uhl-Bien et al., 2007).

CLT's theoretical framework integrates three interdependent functions to balance organizational stability and adaptability (Uhl-Bien et al., 2007):

- Administrative Leadership: Formal managers ensure operational efficiency through strategic planning, resource allocation, and hierarchical coordination, institutionalizing objectives via bureaucratic structures (Selznick, 1957). This function prioritizes predictability, crisis management, and alignment with long-term visions, maintaining the structural integrity necessary for day-to-day functionality.
- Adaptive Leadership: Emerging from informal networks, this process drives innovation through collaborative interactions where agents collectively address adaptive challenges. By leveraging interdependencies and cognitive diversity, adaptive leadership generates emergent solutions that transcend rigid hierarchies, fostering creativity in response to volatility (Uhl-Bien et al., 2007).
- Enabling Leadership: Acting as a mediator, this function bridges bureaucratic and adaptive paradigms. It cultivates environments for flexible processes (e.g., innovation hubs) and facilitates knowledge transfer between informal networks and formal systems. Enabling leadership ensures that adaptive insights become institutionalized without stifling organic creativity, thus harmonizing structural rigor with evolutionary flexibility.

While administrative leadership provides stability, its centralized decision-making and limited horizontal communication (Burns & Stalker, 1961) often constrain agility. Adaptive leadership counterbalances this rigidity by injecting generative disruption through decentralized collaboration, yet risks fragmentation without structural anchors. Enabling leadership resolves this tension by orchestrating conditions for co-evolution, translating emergent ideas into actionable strategies while preserving bureaucratic coherence (Osborn & Hunt, 2007). For instance, adaptive networks might prototype novel solutions to technological disruptions, which enabling leaders then integrate into formal workflows, ensuring alignment with organizational goals. CLT's structural cohesion lies in its capacity to harmonize competing imperatives—stability versus flexibility, control versus emergence. By interweaving administrative, adaptive, and enabling functions, organizations cultivate resilient adaptability, navigating complexity through iterative learning and distributed intelligence. This integrative approach not only mitigates bureaucratic inertia, but also positions organizations to thrive in volatile environments, where sustained success hinges on balancing order with creative disequilibrium.

5. ADAPTIVE LEADERSHIP IN BUREAUCRATIC SYSTEMS: CAS PERSPECTIVE

Within CAS, organizations function as dynamic networks of interdependent agents whose interactions generate emergent patterns of innovation and adaptation. Leadership in this context transcends formal authority, emerging instead from decentralized, heterogeneous interactions among employees, teams, and stakeholders (Heifetz, 1994; Plowman et al., 2007). Adaptive leadership arises when individuals or groups, regardless of hierarchical roles, collaboratively address "adaptive challenges"—problems with no predefined solutions—through dialogue, experimentation, and conflict (Heifetz, 1994). For example, cross-departmental task forces in bureaucratic systems often bypass rigid procedures by leveraging informal networks to resolve systemic bottlenecks, illustrating how leadership influence stems from collective agency rather than top-down mandates. Adaptive leadership is not a planned process, but a systemic characteristic rooted in distributed intelligence. It manifests through continuous learning, knowledge sharing, and self-organization, where innovations emerge organically from informal networks—even at the lowest organizational levels (Plowman et al., 2007).

Formal leaders, rather than dictating solutions, act as architects of context, fostering environments where emergent creativity thrives. Their role shifts from "chief decision-maker" to "enabler of collective intelligence," balancing stability with flexibility by cultivating trust, removing collaboration barriers, and supporting experimentation (Marion & Uhl-Bien, 2001; Regine & Lewin, 2000). A critical enabler of adaptive leadership is psychological safety, where employees feel secure in taking risks, voice dissent, and learn from failures without fear of retribution (Edmondson, 1999). Trust and mutual respect within teams create a foundation for open communication, which drives knowledge exchange and innovation. Edmondson's research underscores that interpersonal dynamics—more than technical resources—determine organizational learning capacity. In bureaucracies, formal leaders nurture this culture by symbolically reinforcing collaboration (e.g., storytelling, workshops) and designing workspaces (physical or digital) that encourage spontaneous interactions (Schein, 2010). Formal leaders in bureaucratic systems must strategically manage multi-level networks to catalyze adaptive processes. This involves:

- Aggregate Level: Strengthening intra-team collaboration through autonomy and delegated decision-making (Manz & Sims, 1984).
- Meta-Aggregate Level: Bridging departmental silos via cross-functional initiatives.
- Meta-Meta-Aggregate Level: Building ecosystems with external partners (e.g., suppliers, communities) to enhance resilience (Regine & Lewin, 2000).

For instance, hybrid work models that blend direct customer-supplier relationships with community partnerships can drive sustainability and adaptability. By enriching these networks, leaders transform bureaucratic rigidity into structured flexibility, where rules adapt to context rather than being followed dogmatically. Adaptive leadership thrives on productive tension. Leaders must balance resolving interpersonal conflicts swiftly while encouraging task-related disagreements that spur innovation (Jehn, 1997). Cross-departmental meetings and digital platforms can dismantle informational silos, fostering multilevel communication. For example, open-office layouts or collaborative tools like Slack create spaces for serendipitous idea exchange, aligning with Schein's (2010) emphasis on workspace design as a cultural lever. CLT redefines leadership as a meta-organizing process where outcomes emerge from nonlinear interactions between intentional agency and spontaneous forces. Formal leaders act as catalysts of self-organization, prioritizing context-shaping over control (Plowman et al., 2007). By delegating authority, nurturing networks, and embracing uncertainty, they enable bureaucracies to develop from rule-bound mechanisms into living systems capable of harnessing collective intelligence. The essence of adaptive leadership lies not in commanding change but in creating conditions where the organization itself becomes the leader, dynamically navigating complexity through emergent, distributed ingenuity.

6. CONCLUSION

The exploration of adaptive leadership within bureaucratic systems through the lens of CAS and CLT reveals a transformative pathway for organizations entrenched in hierarchical rigidity. Traditional bureaucracies, designed for stability and efficiency, falter in dynamic environments where adaptability and innovation are paramount. This paper underscores how integrating CAS principles—nonlinearity, emergence, and self-organization—enables bureaucratic structures to develop into resilient, agile entities capable of navigating complexity. Central to this transformation is the redefinition of leadership as a distributed, emergent process rather than a centralized function. Adaptive leadership, rooted in CLT, shifts the role of formal leaders from controllers to architects of context, who cultivate environments where decentralized interactions and collective intelligence thrive.

By fostering psychological safety, leaders empower employees to engage in risk-taking, dissent, and collaborative problem-solving, thus unlocking the creative potential inherent in informal networks (Edmondson, 1999). This cultural shift is critical for dismantling the inertia imposed by rigid hierarchies and procedural dogmatism. The synthesis of administrative, adaptive, and enabling leadership functions (Uhl-Bien et al., 2007) provides a framework for balancing stability with flexibility. Administrative leadership ensures operational coherence, while adaptive leadership drives innovation through emergent, agent-driven interactions. Enabling leadership bridges these paradigms, translating grassroots insights into institutional strategies without stifling organic creativity. For instance, cross-departmental task forces and hybrid work models exemplify how structured flexibility can coexist with bureaucratic discipline, enabling organizations to respond dynamically to disruptions like technological shifts or global crises. Practically, leaders must prioritize network orchestration across multiple levels—strengthening intra-team collaboration, bridging departmental silos, and building external partnerships (Regine & Lewin, 2000). Workspace design, conflict management, and decentralized decision-making further catalyze adaptive processes, transforming bureaucracies into living systems that leverage distributed intelligence. This research contributes to leadership theory by repositioning adaptive leadership not as a replacement for bureaucracy, but as a catalytic tool for its evolution. By harmonizing hierarchical rigor with CAS principles, organizations can achieve a paradoxical balance—maintaining control while nurturing creativity. Future research should explore longitudinal case studies of bureaucracies undergoing this transformation, particularly in sectors like healthcare or education, where rigidity often impedes innovation. Investigating the role of digital tools in scaling adaptive networks could offer insights into sustaining agility in large, traditionally hierarchical institutions. In conclusion, the transition from bureaucratic stagnation to adaptive vitality hinges on reimagining leadership as a meta-organizing force. By embracing complexity, leaders can transform bureaucracies into ecosystems where order and chaos coexist, fostering resilience and ingenuity in an era defined by uncertainty.

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THE ROLE OF HRM IN ORGANIZATIONS IMPLEMENTING AGILE METHODOLOGIES

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ABSTRACT

In today's dynamic business environment, the role of Human Resource Management (HRM) in organizations implementing agile methodologies is becoming crucial for gaining competitive advantage. Agility enables organizations to rapidly adapt to change, foster innovation, and efficiently manage teams, while HRM plays a central role in facilitating these processes. This paper analyzes how HRM can support the implementation of agile practices through the development and application of strategies that enhance team dynamics, collaboration, and innovation. HRM must adapt to new challenges and methodologies by providing support to agile teams through personalized training, skills development, and enabling flexible working conditions. In organizations adopting agile approaches, HRM is responsible for developing and implementing strategies that foster a collaborative culture and promote continuous innovation. The application of agile methods in HRM involves leveraging digital tools and artificial intelligence (AI) to analyze employee data, predict future skill requirements, and accelerate recruitment and selection processes. Agile organizations also utilize cloud technologies that enable remote work, seamless collaboration, and efficient team management regardless of geographic location. This flexibility enhances organizational resilience and responsiveness to market demands. While technology provides significant advantages, the implementation of agile methods in HRM also faces challenges, including resistance to change, the need for continuous learning and adaptation by HR teams, and the preservation of organizational culture. Despite these challenges, agility in HRM allows organizations to effectively respond to dynamic changes and ensure successful operations in competitive environments.

Keywords: *agility, HRM, innovation, team dynamics*

1. INTRODUCTION

In the modern business environment, which is characterized by accelerated digitization, globalization and unpredictable market changes, organizations face the challenge of remaining competitive, flexible and able to quickly react to new situations. Agility has become a key feature that allows organizations to effectively respond to these challenges, and human resource management (HRM) has a central role in its implementation. By using agile methods, HRM enables organizations to manage talent, improve team dynamics and improve the ability to quickly adapt to circumstances that require immediate reactions, such as crisis situations or unplanned events. The agreement between agility and artificial intelligence (AI) is also a key advantage in HRM. AI can significantly improve organizational agility by automating administrative processes, accelerating selection and recruitment, and analyzing employee performance, thereby enabling HR teams to focus on strategic aspects of the organization. Using AI tools for data analysis also enables the prediction of required skills and personalized development of employees, which improves their preparedness for changes in the market.

Agile teams, characterized by speed of adaptation, high cooperation, autonomy and responsibility, directly influence organizational processes. With the support of digital tools and agile methods, these teams can quickly reorganize and reallocate resources according to new priorities, thus increasing their efficiency and productivity. Innovations such as AI-driven employee satisfaction analysis tools, gamification and engagement platforms can significantly improve motivation, productivity and the learning process within an organization. The introduction of agile methods and innovations in HRM is not only a strategic decision that increases operational efficiency, but is also a key factor in building the organization's competitiveness on the market. The aim of this paper is to provide an overview of the role of HRM in the implementation of agile methods, through the analysis of contemporary practices and challenges.

2. AGILITY OF ORGANIZATIONS

Organizational agility and human resource management (HRM) are important factors for successful adaptation to changes in the modern business environment and as an approach enables organizations to be flexible, quickly react to market changes and effectively manage talent. We say that organizations are agile when they are able to quickly adapt to changes, innovate and respond to market demands through flexible processes, structures and work culture. Agile HRM adapts traditional HR practices to enable greater flexibility and improve employee engagement. Key features of agile HRM are:

- Flexible workforce management includes hiring temporary and project-oriented teams instead of a strict hierarchical structure, with an accelerated hiring process and dynamic adaptation of skills to the organization's requirements.
- The development of employees in the iterative model is based on continuous learning through short formats, targeted trainings and mentoring support, where the emphasis is placed on regular feedback and not on annual performance evaluations.
- The increased involvement of employees in decision-making implies the reduction of administrative obstacles, which encourages autonomy in work, with the application of team cooperation and agile approaches such as Scrum and Kanban.
- The effectiveness of the candidate selection process is improved by the application of digital technologies and artificial intelligence for data analysis, with a special emphasis on the assessment of skills and the candidate's fit with the organizational culture.
- Building an agile organizational culture includes strengthening mutual trust, open communication and willingness to experiment, while directing HR practices towards increasing employee motivation and satisfaction.

Research on agility and human resource management (HRM) shows that the application of agile principles in HR contributes to greater flexibility, faster response to changes and greater employee satisfaction. I will give a few examples:

1. The difference between traditional and agile HR in the recruitment process

- With the traditional approach, companies, especially those in the automotive sector, used long and bureaucratic selection processes that could last up to three months, with clearly defined job descriptions and approvals that went through multiple levels of hierarchy.
- The agile approach was applied, e.g. ING Bank which transformed its HR recruitment process by implementing "scrum" teams and cyclical selection processes. Every 14 days, the teams analyzed incoming candidates, using A/B testing of ads and working closely with the relevant hiring departments (Bersin, 2018).

The result of the introduction of an agile approach allowed the average time of employment to be reduced from 63 to 23 days, with a significant increase in candidate satisfaction.

2. Differences between standard training and agile learning in employee development

- In traditional HR models, training is usually planned on an annual basis and is often out of step with the rapid changes in the industry.
- Spotify applied an agile approach by applying the concept of "learning squads" – small teams that choose the areas in which they want to improve themselves, with regular feedback and exchange of knowledge within the organization (Denning, 2018).
- The result of introducing an agile approach is a higher level of employee engagement and faster application of acquired skills in daily business tasks.

3. The difference between annual evaluation and continuous feedback through performance evaluation

- In the traditional approach, classic performance evaluation is conducted once a year, often without concrete value for employees or managers.
- By introducing an agile approach, Adobe abolished annual evaluations and introduced a system of "check-in" meetings - regular informal conversations between managers and employees about goals, performance and development.

The result of agility is a 30% reduction in employee turnover and an increase in team engagement (Cappelli & Tavis, 2016).

4. Differences between hierarchical and agile structures in HR when we talk about the organizational structure

- In the traditional model, people management goes vertically, which means from strategy to operations, with many layers of approval.
- By introducing the agile model "network of teams" - smaller, multidisciplinary units in the HR sector, Unilever enabled tasks such as leadership development and employment to be solved independently through them.

The result of this agile approach is faster decision-making, better adaptability and greater cooperation with other parts of the organization.

5. The difference between passive support and an agile partner when it comes to the role of HR in changes

- In classic organizational models, HR has the role of an administrative department that provides logistical support during the change process.
- At Bosch, HR teams that have introduced agile models are actively involved in digital transformation processes, where they act as facilitators of change and encourage the development of a growth mindset through joint workshops and interactive activities (Ulrich & Dulebohn, 2015).

The result of this agility is a more effective implementation of changes and a stronger rooting of an innovative culture within the organization.

Accelerated digitization and the emergence of artificial intelligence have changed a lot in the business of organizations, which has also affected their agility. These changes bring numerous advantages, but also challenges. Although there are certain drawbacks, digitization and AI have become an integral part of modern business. Organizations that are more flexible and ready to react quickly to changes become more resilient to future crises and various other challenges.

Artificial intelligence, for example, brings significant help in business through assistants who work around the clock and are always ready to help, facilitate business processes and obtain the necessary information crucial for decision-making. This type of support enables organizations to improve efficiency, reduce human error and improve strategies based on real-time data. A few important areas where these technologies have impacted agility (Table 1):

Area of influence	Impact description
Faster data analysis and decision-making	Artificial intelligence enables HR teams to analyze data and make decisions faster, thus reducing reaction time to changes. Predictive analytics enables timely recognition of new skills needs and recruitment planning.
Automation of HR tasks with chatbots and virtual assistants	Chatbots and virtual assistants automate HR tasks, enable faster and more efficient communication with employees and candidates, reducing the administrative burden. In recruitment, AI analyzes resumes and skills to speed up the selection process.
Personalized training based on AI	AI-based digital and agile training enables personalized learning, and VR and AR technologies enable simulated training, reducing costs and risks.
Flexible working and remote team management	Digital platforms and cloud technologies enable flexible work and effective management of remote teams, accelerating the formation of teams and the adaptability of organizations.
Employee satisfaction analytics and gamification	Advanced analytics uses AI to process feedback and identify challenges, while gamification motivates employees and tracks engagement through personalized tasks.

*Table No. 1 - Impact of artificial intelligence on agility in
HRM Source: Davenport, T. H. (2022)*

The development of modern technologies raises the question of how organizations and the human resource management function managed to function and be flexible in the period before their application. In the past, companies relied on classic methods such as manual management, long-term planning and direct communication, which allowed a certain degree of adaptability, but were not fast and efficient enough in an increasingly complex business environment. With the introduction of artificial intelligence, digital solutions and automation, organizations have significantly improved their ability to react quickly, adapt and optimally manage their human capital. These modern technologies accelerate decision-making, hiring, employee development and engagement processes, enabling a level of agility that was previously difficult to achieve. However, the implementation of agile approaches in HRM is not without challenges. Organizations often face resistance to change, the need for continuous education of HR professionals to work with new technologies, as well as difficulties in preserving organizational culture. Additionally, balancing agile methods and traditional structures remains a challenge for many companies that have not yet fully transformed. Nevertheless, agility becomes necessary to successfully adapt to turbulent market conditions and build a long-term competitive advantage.

3. THE ROLE OF HRM IN ORGANIZATIONS THAT APPLY AGILE METHODS

Human resource management in agile organizations plays a key role in ensuring flexibility, innovation and operational efficiency. The rise of agile methodologies, based on iterative processes, rapid adaptation and teamwork of different experts, is significantly transforming traditional HR approaches. In this context, modern HR focuses on creating a stimulating work environment, fast and open communication, as well as continuous adaptation to market requirements and employee needs (Dikert et al., 2016). While classic HR models rested on rigid hierarchies and static procedures for recruiting, developing and evaluating staff, agile approaches introduce more flexible strategies that include personalized development plans and continuous performance monitoring (Denning, 2018). In this framework, the role of the HR sector is evolving - from an administrative function to a strategic partner that actively contributes to the shaping of organizational culture and the development of team agility (Rigby et al., 2016). In agile organizations, teams function with a high degree of autonomy and make decisions decentralized, which enables faster adaptation and greater responsibility of individuals. In this context, HR management has a significant role in supporting this way of working - through the careful selection of candidates who are flexible, willing to cooperate and ready to learn. HR also actively participates in the development of employee competencies that are key to working in agile teams, as well as in establishing a system of continuous development and adaptation to changes (Highsmith, 2013). By applying agile frameworks like Scrum and Kanban, HR contributes to the organization of more efficient work processes, better team communication and an increased level of employee engagement, which is directly reflected in productivity and job satisfaction (Serrador & Pinto, 2015). Significant aspects of human resource management in agile organizations:

- Selection and recruitment in agile organizations apply flexible candidate assessment models, including task simulations, teamwork assessments and iterative interviews. This approach enables HRM to ensure the rapid and efficient integration of new members into dynamic team structures (Hoda et al., 2018).
- Employee development and training focuses on continuous learning, with an emphasis on personalized learning plans, micro-learning and the use of digital platforms to improve skills. With this approach, HRM enables employees to follow innovations and quickly master new competencies (Bersin et al., 2017).
- Performance management in an agile environment focuses on continuous feedback, rather than annual evaluations. HRM uses techniques such as sprint retrospectives, peer review systems and agile evaluation models to continuously improve work performance (Moe et al., 2010).
- The motivation and engagement of employees is achieved by methods that encourage internal motivation, such as autonomy, the meaning of work and the development of competences. Flexible work models, transparent communication structures and recognition for team contributions enable high levels of employee engagement and satisfaction (Pink, 2009).
- Team dynamics and a culture of innovation become key components of agile HRM, which promotes an organizational culture based on experimentation, rapid adaptation and collaboration. Through the facilitation of team workshops, agile ceremonies, and the use of digital tools for collaboration, HRM helps teams quickly adapt to change and promote innovation (Denning, 2018).

The implementation of agile HRM enables organizations to improve their competitiveness through more effective human resource management.

By developing flexible and collaborative work environments, HRM becomes a key factor in fostering change and innovation, which leads to increased organizational agility and greater resilience to market challenges (Rigby et al., 2016).

4. TEAM DYNAMICS

Team dynamics includes interactions between team members, their mutual relationships, communication, coordination and the ability to work together to achieve set goals. It is aimed at harmonizing the individual skills, experiences and characteristics of each member in order to achieve high efficiency and team success. Optimizing team dynamics becomes crucial in modern organizations that strive for innovation and competitiveness. Research in the field of team dynamics indicates several key factors that significantly influence the efficiency and success of teams, the main findings are:

- Open and effective communication among team members is key to achieving common goals. Research shows that teams with transparent communication processes achieve better results, because they enable quick information exchange, conflict resolution and mutual support (Hinds, Liu, & Lyon, 2011).
- Trust among team members creates the basis for successful cooperation. Teams with a high degree of trust solve problems and make decisions more effectively, because team members feel more secure in mutual support (Costa, Passos, & Bakker, 2014).
- Teams with clearly defined goals and responsibilities function better and achieve better results. Lack of clear division of tasks can lead to disagreements and reduced productivity (Salas, Dickinson, Converse, & Tannenbaum, 2004).
- While there may be communication challenges, diversity in a team, whether it's different skills, experiences or perspectives, often contributes to greater creativity and innovation. Diverse teams often produce better and more innovative solutions (Mannix & Neale, 2005).
- Strong connection and motivation of team members significantly improves their work. Motivated teams with a common goal and mutual support often achieve better results, even in difficult circumstances (Mullen & Copper, 1994).
- An effective leader plays a key role in team dynamics. Leaders who provide clear team direction, help resolve conflict, and balance autonomy and coordination can significantly increase team productivity (Zaccaro, Rittman, & Marks, 2001).
- Teams that quickly adapt to changes and new challenges tend to be more successful. Agile teams that use iterative processes and rapidly test ideas achieve better results, especially in dynamic environments (Highsmith, 2010).

Agility can significantly improve team dynamics by enabling quick adaptation and flexibility in solving challenges. By using agile methodologies like Scrum and Kanban, teams are able to quickly react to changes in the environment, learning from previous experiences through iterative processes and continuous retrospectives. These methods improve the team's ability to adapt to new challenges. Agile methodologies enable rapid reorganization of teams, flexible deployment of resources and accelerated decision-making, which further contributes to the improvement of team dynamics. In that process, HRM has a key role, because it must provide appropriate training, resources and support to employees in the process of adapting to new ways of working. Human resource management plays a key role in shaping team dynamics through the following aspects (Chart 1)

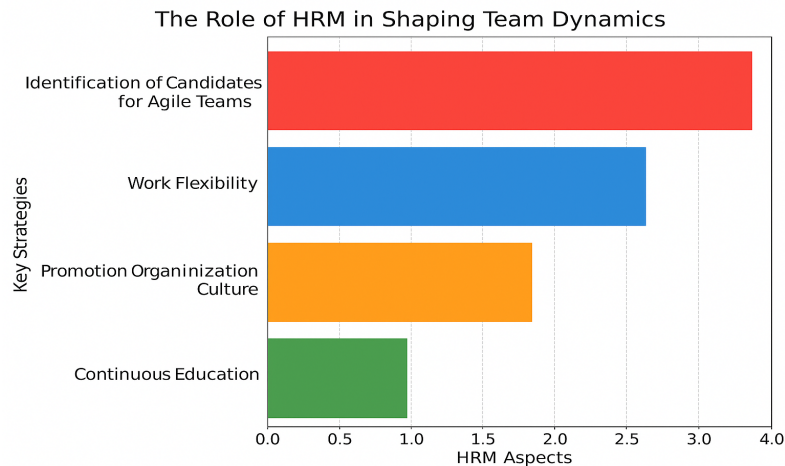


Chart 1 – The role of HRM in shaping team dynamics Source: Tuckman, (1965)

Although the application of agile methodologies and efficient management of human resources significantly contributes to strengthening team dynamics, organizations face several challenges that can threaten the success of teams:

- Employees often show resistance to new work methods, which can hinder their ability to adapt quickly, reducing productivity and increasing frustration among team members.
- Lack of clear and open communication can lead to misunderstandings, reduced trust and poor coordination among team members, which negatively affects the overall efficiency and success of the team.
- If the team's goals are not in line with the organizational goals or are not clearly defined enough, there may be conflicts between team members and reduced engagement, which reduces team cohesion.
- Without proper management support through the provision of resources, training and motivation, teamwork can become ineffective, which negatively affects team dynamics and goal achievement.

Team dynamics is a key success factor in modern organizations, especially those that apply agile approaches. Human resource management has an important role in encouraging and maintaining effective teamwork through continuous education, development of necessary competencies and implementation of strategies that promote joint work and innovation. Agile principles allow teams to quickly adapt to market changes, but their implementation can be difficult due to employee resistance and lack of adequate resources. Through the strategic approach of HR management, it is possible to improve team cohesion, strengthen the organization's resistance to change and preserve its competitive advantage.

5. INNOVATIONS

Innovations in the framework of agility, human resources and team cooperation are becoming increasingly important drivers of improving business processes in modern organizations. In an increasingly unstable and technology-driven business environment, especially with the growing application of artificial intelligence (AI), innovative approaches not only contribute to greater operational efficiency, but also encourage the continuous professional development of employees. Agile organizations have the ability to quickly adapt to changes in the market, which allows for greater alignment between market needs and professional development programs. In the context of HRM, agility means proactively responding to the needs of employees, recognizing their abilities and providing opportunities for continuous learning and progress in changing business conditions (Senge, 1990; Klein, 2003).

Teamwork is one of the basic pillars of organizational success, and its improvement requires the application of modern and innovative approaches that strengthen cooperation, creative thinking and mutual trust among team members. Key team competencies – such as trust, constructive conflict resolution and collective decision-making – enable teams to effectively overcome obstacles and contribute to the achievement of strategic goals. Innovations in the field of teamwork imply the implementation of modern digital tools and methodologies that improve mutual communication and team coordination, which is especially important in the context of remote teams and flexible work (Lencioni, 2002; Tuckman & Jensen, 1977). The introduction of innovations in human resource management and teamwork increasingly includes the application of artificial intelligence (AI) to support decision-making and process optimization. AI contributes through data analysis and automation, but the human factor remains crucial through empathy, creativity and moral reasoning. In this sense, HR professionals use AI to improve the processes of candidate selection, performance evaluation and identification of potential among employees, but key decisions still remain in the domain of human judgment (Brynjolfsson & McAfee, 2014). The development of innovations in the field of human resource management and internal communication increasingly depends on technological progress, but also on the capacity of organizations to preserve key human qualities such as creativity and intuition. Technologies such as artificial intelligence and sophisticated analytical systems are already changing the way modern organizations function, introducing more efficient processes. However, they simultaneously raise important questions about the boundary between automation and the preservation of human innovation, which remains crucial for long-term success. While technology may seem to be taking over many aspects of business processes – from data analysis to decision making – innovation will continue to be the foundation of human creativity, imagination and the ability to see the bigger picture. The human factor will be crucial, as machines cannot replicate the complexity of human emotions, intuition and ability to combine different ideas and contexts in new and useful ways. That being said, man will always be innovative, but it will depend on how technology is used. It is very important that technology is used as a tool to support innovation, not as a substitute for human input. If there is too much reliance on AI and automated systems, there is a risk that people's ability to develop new ideas and think critically will be reduced. Given this, HRM in the future must carefully balance between using technology and preserving space for human creativity and emotional intelligence. It is necessary for HRM to create a culture that encourages learning, experimentation and collaboration, which implies, above all, the introduction of educational programs that allow employees not to rely too much on technology, but to develop their abilities for creative problem solving, decision-making and collaboration. HRM should also promote the active use of emotional intelligence in teamwork, because only through interpersonal connection and understanding can a team come up with truly innovative solutions. Directions that HRM should follow to make teams more innovative:

1. Human resource management should promote a culture of continuous improvement through mentoring, team sessions and digital learning platforms. Such forms of support allow employees to develop their own innovative capacities, without relying solely on technology when making decisions. Innovations most often occur in dynamic environments that foster adaptability and openness to new knowledge (Senge, 1990; Garvin, 1993).
2. HR management should provide physical and virtual spaces where employees can freely explore, experiment and exchange ideas. Such an environment enables the creation of a creative atmosphere, reduces the fear of failure and encourages collaborative problem solving (Amabile, 1998; Edmondson, 1999).

3. Investing in programs that develop emotional intelligence and interpersonal communication skills contributes to better cooperation among employees, greater mutual trust and better conflict resolution. High EQ of employees is associated with greater acceptance of changes and more active participation in innovation processes (Goleman, 2006; Boyatzis, 2008).
4. HR should establish strategies that clearly define when technology, such as artificial intelligence, is useful as a tool to support innovation, and when it is necessary to rely on human creativity and analytical thinking. Technology should complement, not replace, human input (Brynjolfsson & McAfee, 2014; Davenport & Ronanki, 2018).
5. Organizations should develop systems that value originality, reward initiatives and encourage employees to step out of their comfort zone. Such a culture recognizes the effort and courage to experiment, even when the results are not immediately visible (Tushman & O'Reilly, 1997; McKinsey & Company, 2020).

Although technology is advancing rapidly, the key strength of organizations will still be in their employees, their ability to generate new ideas and adapt to new circumstances. HRM in the future should create a balance between innovations brought by technology and preservation of human values such as creativity, interpersonal connection and emotional intelligence. By investing in continuous employee development, creating space for creativity and innovation, and using technology as a support tool, HRM can help organizations stay competitive and lead in rapidly changing industries. Innovative approaches in employee training and development increasingly include the development of emotional skills - such as the ability to manage one's own emotions, understand the emotions of others and build empathic relationships.

These skills are of great importance for team cooperation and conflict resolution, because they enable stable and constructive interpersonal communication, which is necessary for the achievement of common goals (Goleman, 2006). Implementing systems that encourage innovation and creative thinking allows organizations to develop an environment in which employees freely express ideas and test new approaches. Through the creation of creative workspaces and the introduction of flexible working conditions, employees are given the opportunity to make maximum use of their knowledge, skills and intuition. Artificial intelligence can play a supporting role in this process, providing relevant analysis and guidance, but initial creativity and innovative solutions still remain the domain of human thinking (Amabile, 1998; McKinsey & Company, 2020).

6. CONCLUSION

In today's fast-changing business environment, organizations that want to maintain competitive advantage and long-term sustainability must develop agile strategies that enable rapid adaptation to changes and unexpected challenges. Human resource management (HRM) plays a key role in this transformation, as it uses agile approaches to effectively manage talent, improve team relationships and build organizational resilience. The introduction of new technologies, such as artificial intelligence, can further improve HRM agility by automating administrative tasks and enabling personalized approaches to employee development. However, the success of agile organizations depends on achieving a balance between technology and human resources. HRM should ensure that technology serves as a tool to enhance human potential, not as a substitute for creativity and interpersonal skills. Creating space for innovation, constantly investing in employee development and creating a culture that supports creativity are key factors for maintaining competitiveness in the market. In the future, organizations that successfully integrate digital tools and human values will have an advantage in quickly adapting to market changes, fostering innovation and achieving long-term success.

Just as organizations invest in technological innovation, it is equally important to invest in developing emotional literacy and human flexibility. The future of innovation will depend not only on algorithms, but also on the ability of people to use them with purpose, responsibility and creativity.

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STRATEGIC LEADERSHIP IN THE DIGITAL TRANSFORMATION OF HUMAN RESOURCE MANAGEMENT IN SMALL AND MEDIUM-SIZED ENTERPRISES

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ABSTRACT

The rapid advancement of digital technologies has significantly reshaped human resource management (HRM), particularly in small and medium-sized enterprises (SMEs). As organizations adopt automation, artificial intelligence (AI), and data-driven HR solutions, the role of leadership becomes crucial in ensuring a smooth transition and sustainable implementation. This paper explores the strategic leadership approaches necessary for navigating the digital transformation of HRM in SMEs, focusing on overcoming resistance to change, fostering digital readiness, and aligning technological advancements with organizational goals. Through a review of contemporary case studies and best practices, we identify key leadership competencies required to drive innovation, enhance workforce adaptability, and optimize HR functions. The findings highlight the importance of vision, agility, and employee engagement in successfully integrating automation into HRM processes. By addressing both opportunities and challenges, this study provides practical insights for SME leaders aiming to leverage digital transformation for long-term organizational growth.

Keywords: leadership, transformation, SME

1. INTRODUCTION

In serbia's contemporary business landscape, digital transformation has become a pivotal factor for maintaining competitiveness, especially among small and medium-sized enterprises (SMEs). Integrating advanced technologies into human resource management (HRM) processes enables these enterprises to optimize operations, reduce costs, and enhance efficiency. However, the successful implementation of digital solutions necessitates strategic leadership capable of overcoming challenges and leveraging the benefits of digitalization.

Research indicates that serbian enterprises recognize the importance of digital transformation. According to a study titled "digitalization in hrm in serbia: the role of strategic hrm involvement," the main purpose of this paper is to investigate the level of the usage of digital solutions for human resource management (HRM) processes. In the context of hrm, digital technologies such as artificial intelligence (AI) and automation can significantly reduce administrative burdens, allowing hr professionals to focus on strategic activities. For instance, the application of AI in recruitment processes can minimize biases and improve the quality of candidate selection, which is particularly beneficial for smes with limited resources (Bogicevic Milikic et al., 2008). Despite these advantages, many serbian companies face challenges in the digital transformation process. A lack of clearly defined strategies, employee resistance to change, and limited financial resources present significant obstacles.

Therefore, the role of leaders is crucial in driving these changes by promoting a culture of innovation, providing adequate training to employees, and effectively managing transitions. This paper will explore how strategic leadership can support the digital transformation of human resource management in small and medium-sized enterprises in serbia, identifying key success factors and offering guidelines for the effective implementation of digital solutions.

2. LITERATURE REVIEW

2.1 Emotional Intelligence and Change Management

Emotional intelligence (EI) is a critical factor in effective leadership, particularly during organizational change. Leaders with high EI can recognize, understand, and manage their own emotions and those of others, facilitating smoother transitions and reducing resistance to change. Research indicates that emotionally intelligent leaders are adept at addressing employee concerns, building trust, and fostering engagement during periods of transformation. This capability is essential in navigating the human aspects of change management, as it helps mitigate resistance and promotes a more adaptable workforce (Celic, 2020). Now follows visualization in figure 1.

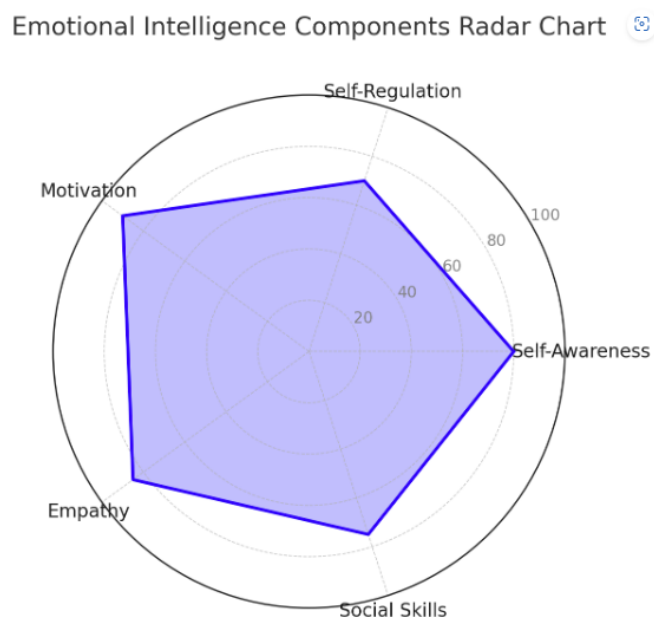


Figure 1: Emotional intelligence components

A study published in the *International Journal of Organizational Analysis* examined the mediating role of psychological capital in the relationship between EI and resistance to change. The findings suggest that EI influences psychological capital, which in turn affects employees' resistance to change, highlighting the importance of EI in managing organizational transitions (Dabic, 2019; Petrovic, 2020).

2.2 Strategic Leadership in HR Automation

Strategic planning in human resources (HR) is vital for aligning HR practices with organizational goals, especially when implementing automation technologies. A strategic approach enables HR leaders to streamline operations, ensuring efficient resource allocation and minimizing redundancies. By anticipating future needs and trends, HR can proactively develop strategies to attract and retain top talent, positioning the organization for success (Janicijevic, 2017).

The integration of technology in HR management has transitioned from a luxury to a necessity. HR executives are increasingly turning to digital solutions to boost operational efficiency, foster data-driven decision-making, and improve the employee experience. This includes automating tasks such as payroll processing, talent management, and compliance, which not only saves time and resources but also allows HR professionals to focus on more strategic initiatives that drive organizational growth (Milutinovic, 2015). Furthermore, the implementation of HR automation tools can significantly enhance operational efficiency. By automating repetitive tasks, reducing manual errors, and improving data accuracy, HR departments can free up resources to focus on strategic initiatives. This shift not only improves efficiency but also supports HR in becoming a more strategic partner within the organization (Krstic, 2012). Authors defined two research hypothesis:

- **Hypothesis 1:** Leaders who demonstrate a high level of emotional intelligence facilitate the acceptance of change and reduce employee resistance to automation.
- **Hypothesis 2:** A strategic approach by leaders in planning and implementing automation enhances operational efficiency within the human resources department.

Emotional Intelligence (EI) in Leadership: Leaders with high EI possess self-awareness, empathy, emotional regulation, and social skills. These competencies enable them to understand and manage their own emotions and those of their team members. Facilitation of Change and Reduction of Employee Resistance: Leaders with high EI can effectively facilitate change by fostering open communication, building trust, and creating a supportive environment. This approach helps in reducing employee resistance to new initiatives, such as automation (Alawneh, 2009). Acceptance of Automation and Reduced Resistance: When employees perceive that their leaders are empathetic and supportive, they are more likely to develop a positive attitude towards change. This leads to increased adaptability, a positive attitude towards automation, and enhanced engagement with new technologies (Vemic Djurkovic, 2020).

All of this can be seen in Figure 2.

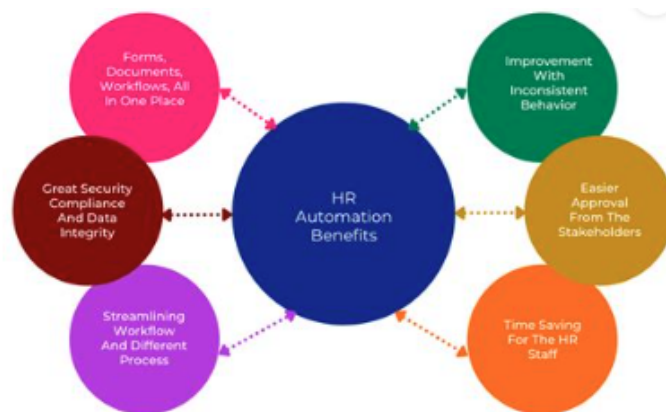


Figure 2: HR Automation benefits

Discussion of research results follows.

3. DISCUSSION OF RESEARCH RESULTS

1. Emotional Intelligence Components in Leadership

This radar chart depicts the five key components of emotional intelligence as defined by Daniel Goleman:

- Self-Awareness: Recognizing and understanding one's own emotions.
- Self-Regulation: Managing and controlling one's emotions in healthy ways.
- Motivation: Harnessing emotions to pursue goals with energy and persistence.
- Empathy: Understanding and sharing the feelings of others.
- Social Skills: Managing relationships to move people in desired directions.

These components are essential for leaders to effectively manage change and reduce employee resistance.

2. Impact of Strategic HR Planning on Operational Efficiency

This radar chart illustrates how strategic HR planning influences various aspects of operational efficiency:

- Talent Acquisition: Effectiveness in attracting and hiring the right talent.
- Employee Development: Success in training and developing employees.
- Performance Management: Efficiency in evaluating and improving employee performance.
- Succession Planning: Preparedness for future leadership needs.
- Employee Engagement: Level of employee commitment and motivation.

Strategic HR planning ensures that these areas are aligned with organizational goals, thereby enhancing overall efficiency.

3. Benefits of HR Automation on Operational Efficiency

This radar chart highlights the key benefits of implementing HR automation:

- Time Savings: Reduction in time spent on administrative tasks.
- Cost Reduction: Decrease in operational costs due to automation.
- Data Accuracy: Improvement in the precision of HR data.
- Compliance: Enhanced ability to adhere to legal and regulatory requirements.
- Employee Experience: Improvement in the overall experience of employees through streamlined processes.

Emotional Intelligence (EI) is a critical factor in effective leadership, especially during organizational changes such as automation. Leaders with high EI can recognize, understand, and manage their own emotions and those of others, facilitating smoother transitions and reducing resistance to change. Research indicates that emotionally intelligent leaders are adept at addressing employee concerns, building trust, and fostering engagement during periods of transformation. This capability is essential in navigating the human aspects of change management, as it helps mitigate resistance and promotes a more adaptable workforce. A study published in the *International Journal of Organizational Analysis* examined the mediating role of psychological capital in the relationship between EI and resistance to change. The findings suggest that EI influences psychological capital, which in turn affects employees' resistance to change, highlighting the importance of EI in managing organizational transitions. Furthermore, integrating EI into change management processes can lead to more effective conflict resolution and a supportive work environment. By understanding and addressing the emotional aspects of change, leaders can reduce resistance and facilitate smoother transitions (Koumas, 2021). Strategic planning in human resources (HR) is vital for aligning HR practices with organizational goals, especially when implementing automation technologies.

A strategic approach enables HR leaders to streamline operations, ensuring efficient resource allocation and minimizing redundancies. By anticipating future needs and trends, HR can proactively develop strategies to attract and retain top talent, positioning the organization for success (Stankov, 2022; Krstic, 2020). The integration of technology in HR management has transitioned from a luxury to a necessity. HR executives are increasingly turning to digital solutions to boost operational efficiency, foster data-driven decision-making, and improve the employee experience. This includes automating tasks such as payroll processing, talent management, and compliance, which not only saves time and resources but also allows HR professionals to focus on more strategic initiatives that drive organizational growth (Jaksic, 2023). Furthermore, the implementation of HR automation tools can significantly enhance operational efficiency. By automating repetitive tasks, reducing manual errors, and improving data accuracy, HR departments can free up resources to focus on strategic initiatives. This shift not only improves efficiency but also supports HR in becoming a more strategic partner within the organization (Melo, 2023). In summary, both emotional intelligence in leadership and strategic planning in HR automation are crucial for facilitating organizational change and enhancing operational efficiency (Slavic, 2013). Leaders who demonstrate high EI can effectively manage resistance to change, while strategic HR planning and automation contribute to streamlined operations and improved organizational performance (Ferdousi, 2023).

4. CONCLUSION

In conclusion, the digital transformation of Human Resource Management (HRM) in Serbia's small and medium-sized enterprises (SMEs) presents both significant opportunities and challenges. Strategic leadership plays a pivotal role in navigating this transition, ensuring that technological advancements align with organizational goals and cultural contexts. Research indicates that Serbian SMEs often exhibit an integrative linkage between the HR function and strategy formulation, with HR managers participating in top management teams. This integration facilitates a more cohesive approach to implementing digital solutions within HRM. However, challenges persist. Many SMEs face obstacles such as limited financial resources, resistance to change among employees, and a lack of clearly defined digital strategies. Overcoming these hurdles requires leaders to foster a culture of innovation, provide continuous training, and effectively manage change processes (Stangl Susnjar, 2016). The adoption of digital tools, including artificial intelligence (AI) and automation, can significantly enhance HR functions by reducing administrative burdens and improving decision-making processes. For instance, AI-powered platforms can assist in workforce planning by predicting recruitment needs and suggesting qualified candidates, thereby optimizing staffing processes (Muktamar, 2023; Hanic, 2016). Looking ahead, it is essential for Serbian SME leaders to embrace strategic leadership practices that support digital transformation. This includes developing clear digital strategies, investing in employee development, and leveraging technology to enhance HRM processes. By doing so, SMEs can improve their competitiveness and adaptability in an increasingly digital business environment.

Future research should focus on longitudinal studies to assess the long-term impacts of digital transformation on HRM within Serbian SMEs. Additionally, exploring sector-specific challenges and best practices can provide more tailored insights, aiding SMEs across various industries in their digital journeys (Rosulj, 2024). In summary, while the path to digital transformation in HRM presents challenges, with strategic leadership and a commitment to innovation, Serbian SMEs can successfully navigate this transition, leading to enhanced organizational performance and sustainability.

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THE GROWING DEMANDS OF THE GLOBAL COMPUTER NETWORK AND THE CURRENT STATE OF INTERNET PROTOCOL DEVELOPMENT

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ABSTRACT

The Internet Protocol (IP) is the fundamental communication protocol in networks, particularly the Internet, enabling data exchange between devices. Today, every computer requires device addressing (computer, smartphone, server) and possesses a unique IP address (e.g., 192.168.1.1 or IPv6 2001:0db8:85a3::8a2e:0370:7334). Data routing directs data packets from sender to recipient across different networks. The protocol is connectionless and does not establish a fixed connection before sending data (unlike, for example, a phone call) [14]. Currently, there is no guaranteed delivery, as IP does not ensure that data will reach its destination (this role is handled by higher-layer protocols, such as TCP). This paper analyzes the characteristics of the first version of the Internet Protocol, IPv4, which has been in global use for a long time. The rapid exponential growth in the number of computing devices connecting to the network has exposed IPv4 to several challenges. Address scarcity is one of the critical issues facing IP. People are using more devices, such as laptops, PDAs, and phones, thereby demanding IP addresses, which have become a critical resource. The authors highlight the need for the development of the Internet Protocol toward greater speed, security, and scalability, with support for new technologies such as IoT, 5G, AI, and decentralized systems. IPv6, QUIC, and Web3 are key drivers of these changes. The paper particularly emphasizes the future demands of modern computer networks for a larger address space, longer address lengths, increased security responsibility for end nodes, improved IP address auto-configuration mechanisms, and mobility to enhance the portability of mobile nodes changing locations.

Keywords: Internet Protocol (IP), IPv4 (Internet Protocol version 4), IPv6 (Internet Protocol version 6), computer network, computer, network security

1. INTRODUCTION

The dramatic rise in the number of internet-connected devices, the development of the Internet of Things (IoT), smart cities, and the demand for greater security and performance are driving the need to modernize internet infrastructure. A key limiting factor is the obsolescence of the IPv4 protocol, which, due to its limited address space (approximately 4.3 billion addresses), can no longer support modern demands. In response to these challenges, IPv6 is being introduced, offering a significantly larger address space (3.4×10^{38} addresses), enhanced security (built-in IPSec), more efficient routing, and better support for mobile devices [1]. This paper analyzes the current state of the global computer network, the challenges of transitioning to IPv6, and the benefits this protocol brings in the context of the future development of the internet.

The Exponential Growth of the Global Computer Network

The global computer network is experiencing exponential growth, driven by the proliferation of smart devices, the Internet of Things (IoT), 5G networks, and the demand for faster and more secure communication. This development necessitates improvements in core internet infrastructure, particularly the internet protocol that enables addressing and data exchange. The dominant protocol for decades has been IPv4 (Internet Protocol version 4), whose limitations have become evident with the increasing number of connected devices. The shortage of available IPv4 addresses, outdated security architecture, and inadequate support for modern technologies have made the adoption of IPv6 (Internet Protocol version 6) essential.

Analysis of IPv4's Shortcomings and the Motivation for IPv6 Migration

The authors have analyzed the main drawbacks of the IPv4 protocol that motivate the migration to IPv6.

Research on IPv4 to IPv6 Migration

The migration from IPv4 to IPv6 has been the subject of numerous studies in the field of computer networks. Some of the most significant works include:

- **Deering & Hinden (1998)** – The authors of RFC 2460, which defines IPv6, highlight the benefits of an expanded address space and improved routability.
- **Huston (2011)** – Analyzed the rate of IPv6 adoption and transition challenges, pointing to slow implementation due to costs and technical complexity.
- **Carpenter & Moore (2001)** – Examined IPv4 and IPv6 interoperability through mechanisms such as dual stack, tunneling (6to4, Teredo), and translation (NAT64).
- **Recent Research (2020–2024)** – Focuses on the application of IPv6 in IoT and 5G networks, particularly in terms of scalability and energy efficiency.

Objective of This Paper: The goal of this paper is to analyze the current state of global network infrastructure, highlight the problems of IPv4 and the advantages of IPv6, and examine the latest advancements in internet protocol improvements. Through a review of relevant literature, the paper will identify key trends and challenges in the full implementation of IPv6 in the future.

1.1. Methodological framework for this research on IP network and protocol development

The goal of this research is to examine the evolution of IP networks and protocols (particularly IPv4 → IPv6), identify key factors for successful migration, and propose strategies to enhance performance, security, and scalability.

Core Hypothesis (H₁): "IPv6 offers superior performance, security, and scalability compared to IPv4, making it the optimal choice for modern and future network infrastructures."

Supporting Hypotheses

- **H₂ (Performance):** "IPv6 reduces latency and routing overhead thanks to its optimized header and elimination of NAT."
- **H₃ (Security):** "Built-in IPsec and advanced protection mechanisms in IPv6 reduce vulnerabilities inherent in IPv4."
- **H₄ (IoT & 5G Compatibility):** "IPv6 better supports massive IoT device connectivity and the demands of 5G/6G networks."
- **H₅ (Economic Aspects):** "The long-term maintenance costs of IPv6 infrastructure are lower than hybrid IPv4/IPv6 solutions."

Research Methodology

a) Qualitative Methods

- **Case Study:** Analysis of successful IPv6 migrations (e.g., T-Mobile, Facebook).
- **Expert Interviews:** Discussions with network engineers and architects regarding implementation challenges.

b) Quantitative Methods

- **Performance Benchmarking:** Comparing latency, throughput, and stability between IPv4 and IPv6 in a controlled testbed environment.
- **Network Simulations:** Using tools such as **GNS3** and **OMNeT++** to model scenarios with >100,000 nodes.
- **Packet Analysis (Wireshark):** Examining the efficiency of IPv6 headers compared to IPv4.

c) Comparative Analysis

Table 1 presents a comparative evaluation of criteria and verification methodologies for IPv4 and IPv6.

Table 1.: Comparative Evaluation of Criteria and Verification Methodologies for IPv4 and IPv6

Criterion	IPv4	IPv6	Verification methodology
Routing speed	NAT dependent	Direct routing	Unit of measurement: μ s/packet
Security	IPsec optional	IPsec required	CVE vulnerability analysis
Scalability	Limited space	Unlimited space	Test with 1M+ devices

Research Variables and Methodology

The following research variables will be applied during the investigation:

1. Dependent Variables (Outcome):
 - Network performance (latency, throughput, packet loss)
 - Security risks (number of identified vulnerabilities)
 - Implementation costs (CAPEX/OPEX)
2. Independent Variables (Input):
 - Protocol type (IPv4, IPv6, dual-stack)
 - Network topology (LAN, WAN, data center)
 - Traffic type (video, IoT, VoIP)

3. Data Collection and Analysis Instruments:
 - Network analyzers: Wireshark, tcpdump
 - Cloud platforms: AWS IPv6 lab, Google Cloud global tests
 - Surveys: Questionnaires for network operators about IPv6 experiences
4. Statistical Methods:
 - Correlation analysis - Does higher IPv6 adoption reduce attack incidents?
 - T-test - Verification of latency differences between IPv4 and IPv6
5. Hypothesis Validation Conditions:
 - H_1 : Confirmed if IPv6 demonstrates $\geq 20\%$ better performance in mass connectivity simulations
 - H_2 : Measured through latency in 5G core networks with/without NAT
 - H_3 : Analyzed through number of successful attacks on IPv4 vs. IPv6 networks
6. Research Limitations:
 - Legacy system compatibility - Some devices don't support IPv6
 - Sample representativeness - Tests conducted on limited number of networks
7. Expected Research Contributions:
 - Practical: Recommendations for IPv6 migration in enterprise environments
 - Theoretical: Cost assessment model for transition
8. Potential Applications of Research Results:
 - For ISPs planning IPv6 rollout
 - For regulatory bodies developing support policies
 - For hardware manufacturers improving IPv6 support

1.2 Limitations of IPv4 Addressing

1.2.1. Lack of Address Space

The main drawback of the IPv4 protocol is the limited number of available addresses. IPv4 uses 32-bit addressing, which allows for only ~4.3 billion unique addresses. The exponential growth of the internet and the increasing number of connected devices have led to the rapid depletion of this address space. An additional problem is the inefficient allocation of addresses—many were assigned in large blocks but remain unused [2]. Characteristics of the IPv6 Protocol: IPv6 represents a logical and evolutionary phase in the development of IP networks and can even be considered its final stage. During the development of IPv4 technology, it was unimaginable to assume that 4.3 billion addresses would one day become insufficient for addressing all devices on the global network. IPv6 is built on the foundations and experiences gained from working with IPv4 networks while also introducing its own unique functionalities. The key improvements introduced by IPv6 include:

1. **Larger Address Space:** IPv6 uses 128-bit addresses (compared to 32-bit in IPv4), allowing for a significantly larger number of available addresses. This enhancement eliminates the need for NAT (Network Address Translation) and the distinction between public and private addresses, which is characteristic of IPv4.
2. **Elimination of Broadcast Addressing.** IPv6 defines three basic types of addressing:
 - Unicast – Communication with a single destination (1:1).
 - Multicast – Communication with multiple destinations (1:N).
 - Anycast – Communication with the nearest destination in a group (1:nearest of N).
 Unlike IPv4, IPv6 does not use broadcast addressing, which is resource-intensive.
3. **Simplified Packet Header:** The IPv6 header is optimized for more efficient processing on routers. Additional information is placed in packet extensions, speeding up routing, especially for intermediary routers whose sole task is packet forwarding.

4. Built-in Support for Security and Mobility

Unlike IPv4, IPv6 includes native support for IPsec (a security protocol) and IP mobility, simplifying the implementation of advanced security and mobile solutions.

5. Automatic Address Configuration (Autoconfiguration)

IPv6 enables automatic address generation via Stateless Address Autoconfiguration (SLAAC), where the Data Link Layer address is converted into an IPv6 address. This provides plug-and-play functionality without requiring a DHCP server.

6. IPv6 Address Prefixes

The prefix of an IPv6 address indicates the network portion and is written in CIDR notation (e.g., 2001:db8::/32), similar to IPv4. The prefix length can range from 0 to 128 bits.

7. Multiple Addresses per Interface

Each IPv6 interface can have multiple addresses of different types that can be used simultaneously.

8. Link-Local Addresses

IPv6 devices automatically generate link-local addresses for each interface, which are used exclusively for local communication within the same network segment (similar to private IPv4 addresses).

9. Provider-Aggregatable (PA) and Provider-Independent (PI) Addressing

Due to the vast number of available addresses, organizations can use:

- Provider-Aggregatable (PA) addressing – Addresses assigned by an ISP.
- Provider-Independent (PI) addressing – An organization's own address space, independent of an ISP.

In the following chapters, we will examine the individual characteristics of the IPv6 protocol in more detail, with a special focus on mobility as an advanced service of IPv6 networks [5].

1.2.2 Routing and Scalability Issues

The increasing number of networks has led to the growth of routing tables, burdening routers and making network infrastructure maintenance more difficult. To mitigate this issue, mechanisms such as:

- VLSM (Variable-Length Subnet Mask) – Allows more flexible allocation of address space.
 - CIDR (Classless Inter-Domain Routing) – Reduces routing table size by aggregating addresses.
- were introduced. However, these solutions are only temporary and do not fundamentally solve the problem of limited address space.

1.2.3 Dependence on NAT and Its Consequences

As a response to IPv4 address exhaustion, NAT (Network Address Translation) was introduced, allowing multiple devices to share a single public IP address. While NAT has extended the lifespan of IPv4, it also has significant drawbacks:

- Complicates end-to-end communication, making peer-to-peer (P2P) applications harder to implement.
- Reduces network transparency, potentially affecting performance and security.
- Does not solve long-term scalability issues.

IPv4 requires manual IP address configuration or reliance on DHCP (Dynamic Host Configuration Protocol) for automatic assignment. With the growing number of devices (especially in IoT), this approach becomes inefficient and requires additional administrative effort.

Security and Mobility Limitations:

- Security constraints – IPv4 lacks built-in IPSec support, requiring additional implementation.
- Limited mobility – IPv4 was not designed to support seamless mobility for devices switching networks.

Quality of Service (QoS) and Performance Limitations

The "Type of Service" (ToS) field in the IPv4 header enables a basic level of QoS but is insufficient for modern demands, especially in encrypted communications.

1.2.4 Temporary Solutions and the Need for IPv6

Mechanisms like NAT, CIDR, and VLSM have prolonged IPv4 usage but remain stopgap solutions. In response to these limitations, the Internet Engineering Task Force (IETF) developed IPv6, a new protocol version featuring:

- 128-bit addresses (3.4×10^{38} addresses) – Solves address exhaustion.
- Built-in IPSec – Enhanced security.
- Efficient routing – Simplified header structure.
- Autoconfiguration (SLAAC) – Easier device connectivity.
- Improved QoS and mobility support.

IPv6 was standardized through a series of RFC documents (RFC 1752, 1883, 1886, 1971, 1993) and represents a long-term solution for modern global networking challenges.

1.3 Characteristics of the IPv6 Protocol

IPv6 represents a logical and evolutionary phase in the development of IP networks and can even be considered its final stage. During the development of IPv4 technology, it was unimaginable to assume that 4.3 billion addresses would one day become insufficient for addressing all devices on the global network. IPv6 is built on the foundations and experiences gained from working with IPv4 networks while also introducing its own unique functionalities. The key improvements introduced by IPv6 include:

1.3.1 Larger Address Space

IPv6 uses 128-bit addresses (compared to 32-bit in IPv4), enabling a significantly larger number of available addresses. This enhancement eliminates the need for NAT (Network Address Translation) and the distinction between public and private addresses, which was characteristic of IPv4.

1.3.2 Elimination of Broadcast Addressing

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1.3.3 Simplified Packet Header

The IPv6 header is optimized for more efficient processing on routers. Additional information is placed in packet extensions, speeding up routing—especially for intermediary routers whose sole task is packet forwarding.

1.3.4 Built-in Support for Security and Mobility

Unlike IPv4, IPv6 natively supports IPSec (security protocol) and IP mobility, simplifying the implementation of advanced security and mobile solutions.

1.3.5 Automatic Address Configuration (Autoconfiguration)

IPv6 enables automatic address generation via Stateless Address Autoconfiguration (SLAAC), where the Data Link Layer address is converted into an IPv6 address. This provides plug-and-play functionality without requiring a DHCP server.

1.3.6 IPv6 Address Prefixes

The prefix of an IPv6 address indicates the network portion and is written in CIDR notation (e.g., 2001:db8::/32), similar to IPv4. The prefix length can range from 0 to 128 bits.

1.3.7 Multiple Addresses per Interface

Each IPv6 interface can have multiple addresses of different types, which can be used simultaneously.

1.3.8 Link-Local Addresses

IPv6 devices automatically generate link-local addresses for each interface, which are used exclusively for local communication within the same network segment (similar to private IPv4 addresses).

1.3.9 Provider-Aggregatable (PA) and Provider-Independent (PI) Addressing

Due to the vast number of available addresses, organizations can utilize:

- Provider-Aggregatable (PA) addressing – Addresses assigned by an ISP.
- Provider-Independent (PI) addressing – An organization's own address space, independent of an ISP.

In the following sections, we will examine the individual characteristics of the IPv6 protocol in greater detail, with a special focus on mobility as an advanced service of IPv6 networks.

2. IP MOBILITY

Today, the internet has become an indispensable part of daily life, and modern devices such as laptops, smartphones, tablets, and gaming consoles are nearly non-functional without global connectivity. The fast pace of modern living and increasing user mobility demand that devices maintain seamless internet access—whether via wired (Ethernet) or wireless (Wi-Fi, mobile data) networks. However, traditional network connectivity relies on dynamic IP address assignment (e.g., via DHCP), which causes the IP address to change when switching networks. As a result, all active sessions (e.g., video calls, data transfers) are interrupted, disrupting workflow continuity. To address this issue, the Internet Engineering Task Force (IETF) developed the Mobile Internet Protocol (MIP). MIP enables mobile devices to retain their original IP address even when changing network locations, ensuring connection continuity and preserving all active sessions [4].

2.1 IPv6 Mobility

Mobile IP (MIP) is a standardized communication protocol developed by the IETF. Its purpose is to allow mobile devices to move between networks while maintaining their Layer 3 (Network Layer) address. Mobile IP ensures that:

- Mobile nodes retain the same IP address, enabling uninterrupted higher-layer services.
- Mobile nodes can communicate with both mobile and fixed devices.
- Mobile nodes maintain the same level of security and reliability as fixed nodes.

There are two Mobile IP standards:

1. MIPv4 – Designed for IPv4 networks, currently dominant due to longer usage.
2. MIPv6 – Developed for IPv6, with built-in improvements that address MIPv4's limitations.

Thanks to its advanced functionalities, MIPv6 is expected to eventually replace MIPv4.

2.1 Entities and Basic Concepts of MIP Architecture

To describe IP mobility support, it is essential to define key terms and entities [6].

A Mobile Node (MN) is a device (host or router) that changes its point of attachment from one network or subnet to another while maintaining its original IP address. This allows it to continue communicating with other nodes on the internet, provided a connection exists at the new location [3].

Key Entities in Mobile IP:

1. Home Address (HoA)
 - A permanent IP address assigned to the mobile node within its home network (HN).
 - This address remains unchanged regardless of the mobile node's location.
2. Care-of Address (CoA)
 - A temporary IP address used by the mobile node when outside its home network.
 - There are two types of CoA:
 - a) Foreign CoA (FCoA)
 - Assigned by a Foreign Agent (FA) via advertisement messages.
 - In this case, the CoA is the FA's IP address, which receives and decapsulates packets before forwarding them to the mobile node.
 - Multiple mobile nodes can share the same FCoA, conserving IPv4 address space.
 - b) Co-located CoA (CCoA)
 - Obtained directly by the mobile node (e.g., via DHCP or IPv6 autoconfiguration).
 - Used when no Foreign Agent is present (common in IPv6 networks).
 - The tunnel endpoint is the mobile node itself.
3. Home Network (HN)
 - The network where the mobile node's permanent address (HoA) is assigned.
4. Foreign Network (FN)
 - Any network outside the home network where the mobile node moves.
5. Home Agent (HA)
 - A router in the home network that: Tunnels packets to the mobile node while it is away; Maintains binding records of the node's current location (via CoA).
6. Foreign Agent (FA)
 - A router in the foreign network that provides routing services for the mobile node. Its roles include: Decapsulating packets sent by the HA; Serving as the default router for the mobile node.
7. Correspondent Node (CN)
 - A device that communicates with the mobile node.
 - Can be either a fixed or mobile device.
 - In terminology, any device with mobility features is called a mobile node, while any device/server communicating with it is termed a correspondent node.

This architecture ensures seamless mobility while maintaining connectivity and security.

2.2 Basic Principles of Mobile IP

Mobile IP performs three key functions:

- Agent Discovery
- Agent Registration
- Tunneling

Agent Discovery Function

This function enables the Mobile Node (MN) to determine:

- Whether it has changed networks
- Whether it is in its Home Network (HN) or a Foreign Network (FN)
- Which Care-of Address (CoA) is offered by the Foreign Agent (FA)

The process consists of two main mechanisms:

1. Agent Solicitation

- The MN sends an ICMP message to request agent information.
- Limited to three messages per second initially, with reduced frequency after registration.

2. Agent Advertisement

- The FA periodically broadcasts ICMP messages to announce its availability.
- Even if overloaded, the FA must continue sending advertisements to confirm the MN is still within its network.

Agent Registration Function

Once discovery is complete, the MN knows whether it is in the HN or FN:

- If in the HN, it operates as a standard IP device.
- If in a FN, it uses Mobile IP and registers its temporary CoA with the Home Agent (HA) so the HA can tunnel packets to it.

There are two registration algorithms, depending on the CoA type (FCoA or CCoA) and registration status (registration, deregistration, or reregistration) [7].

Algorithm 1 (Simpler Approach – Used with CCoA)

Applies when the MN has a Co-located CoA (CCoA) and can communicate directly with the HA. Steps:

1. The MN sends a registration request to the HA.
2. The HA responds with a confirmation.

This method is also used when the MN deregisters after returning to the HN.

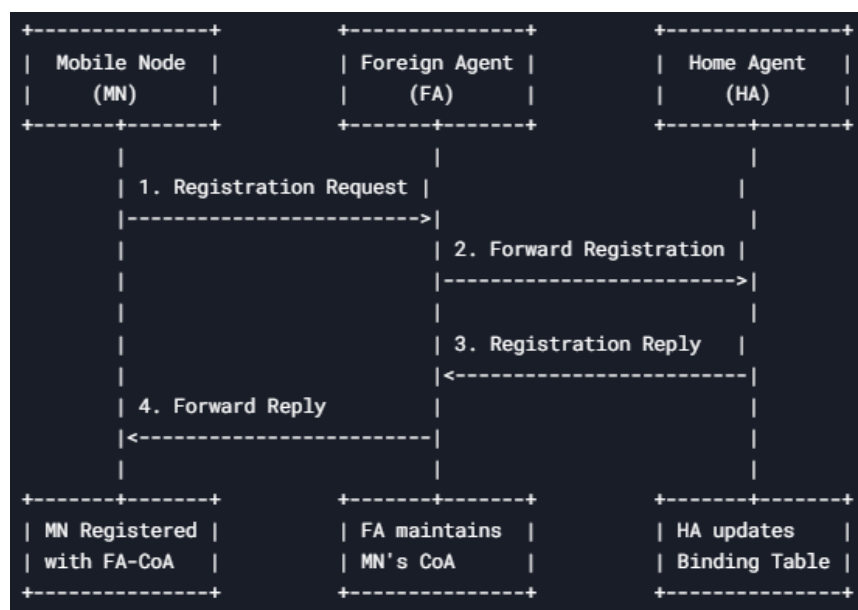


Figure 1.: Algoritam registracije agenta kada se koristi FA

Steps of the Algorithm Shown in Figure 1:

1. **MN Sends Registration Request to FA**
 - After obtaining the FA-CoA through an Agent Advertisement message, the MN sends a registration request to the Foreign Agent (FA).
2. **FA Forwards Registration Request to HA**
 - The FA receives the request, adds its own information (FA-CoA), and forwards it to the Home Agent (HA).
3. **HA Sends Registration Reply to FA**
 - The HA validates the request, updates its binding table (associating the MN with the FA-CoA), and sends a confirmation back to the FA.
4. **FA Forwards Registration Reply to MN**
 - The FA receives the reply from the HA and forwards it to the Mobile Node, completing the registration process.

Tunneling Process

Tunneling is the process by which the Home Agent (HA) intercepts packets destined for the Mobile Node (MN) and tunnels them to its current Care-of Address (CoA). This involves encapsulating the original packet within a new header to enable routing, while the packet payload remains readable only at the tunnel endpoints.

- A tunnel is a logical path through the internet that transports encapsulated data.
- In Mobile IP, one end of the tunnel always belongs to the Home Agent (HA), while the other end can be:
 - The Foreign Agent (FA) (if present in the foreign network),
 - The Mobile Node (MN) itself (if using a Co-located CoA directly).

The tunneling process includes:

- Encapsulation at one end of the tunnel,
- Transmission of the encapsulated packet across the internet,
- Decapsulation at the other end of the tunnel.

2.3 Weaknesses and Limitations of MIPv4

Mobile IPv4 requires the Mobile Node to maintain two addresses:

- **Home Address (HoA)** – Assigned in the home network (HN),
- **Care-of Address (CoA/FCoA)** – Obtained in the foreign network (FN).

MIPv4 uses network-level mediation to route packets to the Mobile Node:

- When a Correspondent Node (CN) sends packets to the MN, they are first routed to the HA.
- The HA tunnels the packets from the HoA to the MN's CoA in the foreign network.
- Traffic from the MN to the CN can be sent directly, without HA involvement.

2.3.1 Key Weaknesses of MIPv4

1. **Triangular Routing**
 - All packets from the CN to the MN must pass through the HA, even if the CN and MN are geographically close.
 - This leads to **suboptimal routing** and **increased latency**.
2. **Encapsulation Overhead**
 - The additional encapsulation header increases packet size, which:
 - Consumes more bandwidth,
 - May cause **fragmentation** and **performance degradation**.
3. **Fragility – HA as a Single Point of Failure**
 - The HA represents a **bottleneck**—if it fails, communication with the MN is disrupted.
 - **Solution:** Deploy multiple HAs in the home network for redundancy.

4. Issues with Real-Time Applications

- Additional latency and **jitter** caused by triangular routing and encapsulation can disrupt **VoIP**, **video calls**, and similar services.

Figure 2 illustrates the triangular routing problem in MIPv4 operation.

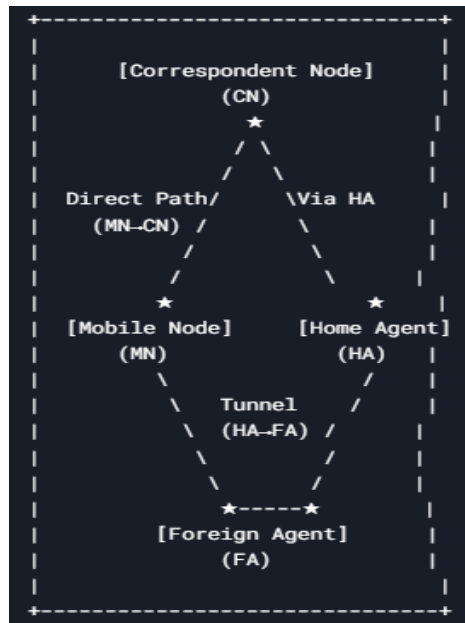


Figure 2.: The Tripartite Routing Problem Through the Operating Principle of MIPv4

Explanation of the Symbolic Representation

The diagram includes:

- Solid arrow (—►) = Mandatory routing via the Home Agent (HA).
- Dashed arrow (- - ►) = Direct route.
- Circular arrangement emphasizes routing imbalance.

Packet Flow

1. CN → HA → FA → MN (Slow, suboptimal route – triangular routing):
 - Packets from the Correspondent Node (CN) must pass through the HA (even if CN is near MN).
 - The HA tunnels packets to the Foreign Agent (FA) or directly to the MN (if using CoA).
2. MN → CN (Direct route – no HA involvement):
 - The Mobile Node (MN) sends packets directly to CN.

Key Problems Illustrated in the Diagram

- Part of the traffic (CN→MN) takes a longer path.
- HA acts as a mandatory intermediary node.
- Routing asymmetry (MN can send directly, but CN cannot).

Weaknesses of MIPv4 and Foundations of IPv6 Mobility

1. Dependency on Foreign Agents

A major drawback of MIPv4 is the requirement for a Foreign Agent (FA) in the visited network.

The FA is needed to:

- Detect the presence of the Mobile Node (MN).
- Assign it a temporary Care-of Address (CoA).
- In networks without an FA, the MN cannot establish a connection.

2. Security Issues

Key security flaws in MIPv4 arise from: Untunneled outbound traffic: Packets from MN to CN use the Home Address (HoA) as the source IP; Since HoA is topologically invalid (not part of the foreign network), firewalls and border routers often drop these packets due to anti-spoofing protection; This opens the door for IP spoofing attacks, where attackers can impersonate legitimate nodes.

3. Solutions and Advantages of IPv6

While these issues can be partially mitigated with additional mechanisms (e.g., reverse tunneling), MIPv6 addresses them fundamentally by:

- Eliminating the need for Foreign Agents (MN self-configures CoA).
- Built-in security mechanisms (e.g., IPsec for encryption).

2.4 Basics of IPv6 Mobility

MIPv6 is designed to leverage IPv6 advantages and overcome MIPv4 limitations. Core similarities with MIPv4 include [8]: The MN detects its location and behaves like a fixed node while in the home network. Improvements over MIPv4:

In IPv6, the Mobile Node is assigned three addresses:

1. Home Address (HoA): Permanent, unchanged when roaming.
2. Link-Local Unicast Address: Used for local communication in foreign networks.
3. Care-of Address (CoA): Similar to MIPv4 CoA but auto-configured (no FA needed).

Advantages of MIPv6 over MIPv4:

- Route optimization: Direct MN↔CN communication (no triangular routing).
- Reduced overhead: No mandatory encapsulation for outbound traffic.
- Enhanced security: Built-in encryption and authentication.

MIPv4	MIPv6
Requires Foreign Agents (FA)	No Foreign Agents (CoA auto-config)
Triangular Routing (CN-HA-MN)	Direct Routing (CN-MN)
HoA Spoofing Risks	IPsec Encryption

Figure 3.: Comparison table: MIPv4 vs MIPv6

CoA address in MIPv4 is auto-configured, so the presence of a foreign agent in the foreign network is not required to enable mobility functionality. Therefore, CCoA (Co-Located Care-of Address) is used here as the type of CoA address. CoA address in MIPv4 and MIPv6:

- MIPv4: Uses CCoA (Co-Located Care-of Address) which is auto-configured without a foreign agent. Packets are routed normally since the CoA shares the prefix with the foreign network.

- MIPv6: Introduces bidirectional tunneling between the home agent (HA) and the mobile node (MN), which: Ensures topologically correct addresses; Prevents packet dropping by firewalls.

The requirements for IPv6 mobility are that the mobile node must:

- Determine its location.
- Inform the HA and other nodes of its CoA address.
- Enable direct routing of outgoing packets

The basic operations of IPv6 mobility include:

- **CoA addresses:** The MN can have multiple CoA addresses in a foreign network. CoA configuration includes:
 - *Stateless autoconfiguration:* CoA = Network prefix + Interface ID
 - *Stateful autoconfiguration:* Using DHCPv6
- **Registration process:** Consists of the procedure where the MN sends a *Binding Update* message to the HA. The HA confirms with a *Binding Acknowledgement*.

2.5 IPv6 Mobility Operations

A Mobile Node (MN) can have one or more Care-of Addresses (CoAs) while in a foreign network [10]. Key characteristics include:

1. CoA Address Configuration

- Stateless Autoconfiguration: CoA = Network Prefix + Interface ID (automatically generated without additional services).
- Stateful Autoconfiguration: Uses DHCPv6 services in the foreign network.

2. Binding

- The process of associating the Home Address (HoA) with the current CoA.
- The MN sends a Binding Update (BU) message to the Home Agent (HA).
- The HA confirms registration with a Binding Acknowledgement (BA) message.

3. Packet Routing

- All packets addressed to a valid CoA are correctly delivered to the MN.
- The CoA shares the network prefix with the local subnet of the foreign link.

4. Registration Process

The registration process in MIPv6 enables more efficient mobility compared to MIPv4, eliminating the need for a foreign agent and allowing more direct communication. The Binding Update/Binding Acknowledgement mechanism ensures the timeliness of location information, while IPsec provides message integrity.

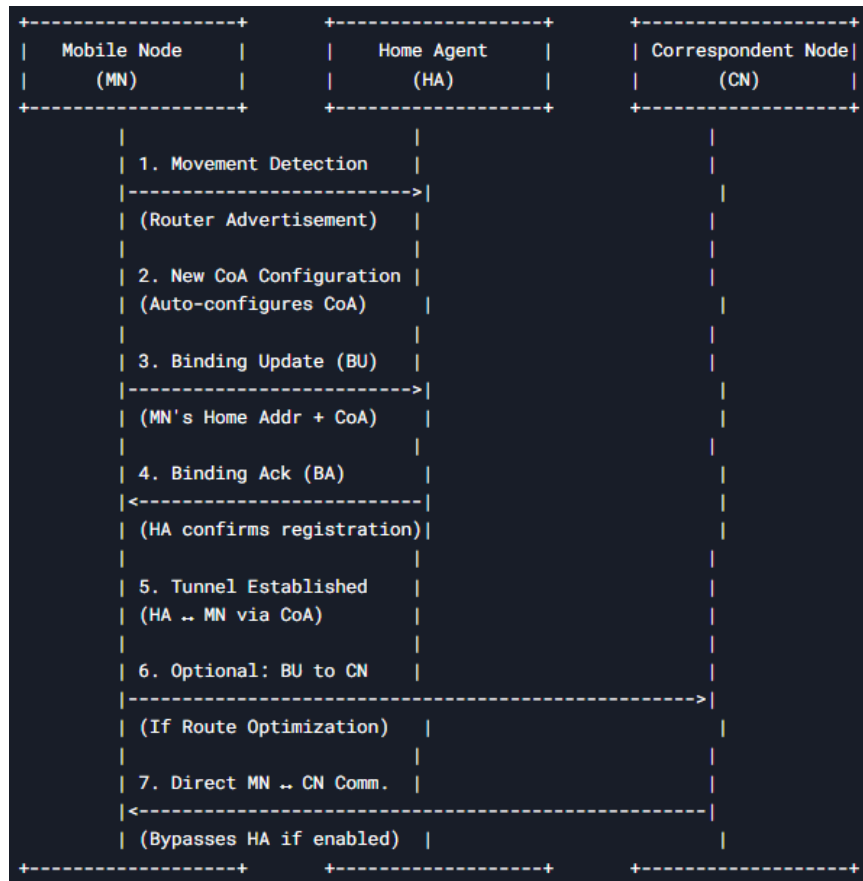


Figure 4.: Registration Process of MN in MIPv6

4. ANALYSIS OF KEY ASPECTS OF IPv6 IMPLEMENTATION

The core performance advantages in wireless networks (5G/Wi-Fi 6) relate to more efficient routing—the IPv6 header with fixed lengths (40 bytes) reduces processor load on router infrastructure, which is critical for low latency in 5G networks [11]:

- Mobility (MIPv6) – Built-in support for Mobile IPv6 enables seamless handover between base stations, ideal for VoLTE and IoT devices.
- Multicast optimization – Support for MLDv2 (Multicast Listener Discovery) improves content distribution (e.g., video streaming in mobile networks).

Challenges for IPv6:

- Higher overhead in LoRaWAN/Wi-Fi HaLow – IPv6 addresses (128-bit) consume more radio resources than IPv4 in Low-Power WAN networks.
- Fragmentation in mesh networks – Larger MTU (Minimum Transmission Unit) can cause issues on IEEE 802.15.4 devices (e.g., Zigbee).

Key Advantages of IPv6 Address Management:

- Hierarchical allocation – IPv6 uses /64 prefixes for each subnet, eliminating subnetting issues.
- SLAAC (Stateless Address Autoconfiguration) – Devices auto-generate addresses using EUI-64, reducing reliance on DHCP servers.
- Global unicast space (2000::/3) – Unique addressing without NAT simplifies end-to-end connectivity.

IPv6 Implementation Risks:

- Improper allocation – Organizations often request /48 prefixes when /56 would suffice, leading to address waste.
- SLAAC security risks – RA (Router Advertisement) spoofing can enable MITM attacks.

Security Aspects of IPv6 Implementation:

Improvements in implementation:

- Mandatory IPsec – Network-layer encryption for all communications.
- Privacy Extensions – Randomly generated addresses prevent tracking (e.g., RFC 8981).

New vulnerabilities post-implementation:

- Neighbor Discovery Protocol (NDP) attacks – RA message spoofing or rogue DHCPv6 servers.
- DAD (Duplicate Address Detection) exploits – DoS attacks via fake DAD messages.

Compatibility with Legacy Systems

Solutions:

- Dual-Stack – Parallel IPv4/IPv6 operation (most common approach).
- Tunneling (6in4, 6to4) – IPv6 packets encapsulated in IPv4 (useful for transition periods).
- Translation (NAT64/DNS64) – Allows IPv6 devices to access IPv4 resources.

IoT and Edge Computing Implications

Optimizations:

- 6LoWPAN – IPv6 header compression for sensor networks (e.g., Thread protocol).
- MQTT over IPv6 – Improved efficiency in IIoT (Industrial IoT) systems.

Key limitation: Memory requirements – Small embedded devices (e.g., ESP32) need ≥ 128 KB RAM for full IPv6 support.

Network Monitoring and Troubleshooting

Implementation tools:

- ICMPv6 – Replaces ARP, enables ping6 and traceroute6.
- sFlow/IPFIX – Supports IPv6 telemetry.

Main challenges: Lack of IPv6 support in legacy tools—Wireshark and SNMP must be updated.

Implementation Recommendations:

1. Phased migration approach – Start with dual-stack in the core network, then gradually phase out IPv4.
2. Address space segmentation – Use /48 for sites, /64 for subnets per RFC 6177.
3. Hardware upgrades – Verify compatibility with TSO (TCP Segmentation Offload) for IPv6.
4. Staff training – Certifications like IPv6 Forum Silver/Gold.

IPv6 offers technical superiority across all segments—from wireless networks to massive IoT. However, successful implementation requires deep understanding of its specifics, especially in heterogeneous environments. Key success factors include address allocation planning, security hardening, and investment in training.

IPv6 in Software-Defined Networking (SDN)

SDN (Software-Defined Networking) revolutionizes network management through centralized control and programmability, with IPv6 playing a key role in modern SDN architectures. Table 2 shows IPv6 support [15].

Key Advantages of IPv6 Implementation in SDN Environments:

- Flexibility – SDN controllers can dynamically adjust IPv6 prefixes based on requirements (e.g., for IoT devices).
- Automatic Optimization – AI/ML algorithms in SDN can analyze IPv6 traffic flows and optimize QoS.
- Centralized Security Control – SDN can block IPv6 attacks (e.g., RA spoofing) through global policies.

Table 2.: Key SDN Protocols with IPv6 Support

Protocol	IPv6 Support Level	Key Features for IPv6	Use Case
OpenFlow	Full (since v1.2)	Supports IPv6 matching fields (128-bit addresses, Traffic Class, Flow Label)	SDN data plane programming
NETCONF/YANG	Full	Native IPv6 transport (SSH/TLS), IPv6-specific data models	Network configuration automation
P4	Full	Programmable IPv6 header parsing/forwarding	Protocol-independent forwarding
BGP-LS	Full (RFC 7752)	Carries IPv6 topology info (link-state, TE metrics)	SDN controller topology discovery

Practical Implementation Examples:

a) SD-WAN with IPv6

- EVPN for IPv6 – MPLS SD-WAN can transport IPv6 over EVPN (Ethernet VPN).
- Dynamic Routing – The SDN controller selects optimal routes for IPv6 sites based on metrics (latency, packet loss).

b) 5G Core Networks (5GC)

- UPF (User Plane Function) uses IPv6 for ultra-low latency in services like AR/VR.
- Network Slicing – SDN assigns dedicated IPv6 prefixes per slice (e.g., one for IoT, another for eMBB).

c) Data Center Networks

- VXLAN with IPv6 – Enables IPv6-supported overlay networks.
- Kubernetes + IPv6 – SDN plugins (Calico, Cilium) support IPv6 for container communication.

Future Development Directions:

- AI-Driven IPv6 SDN – Machine learning for IPv6 traffic prediction and resource optimization.
- Quantum-Safe IPv6 Encryption – Integration of post-quantum cryptography into SDN security for IPv6.
- IPv6-Only SDN Networks – Gradual elimination of IPv4 from SDN infrastructure.

Conclusion: IPv6 in SDN environments accelerates innovation through programmability, automated resource allocation, and enhanced security. While technical challenges remain (performance, compatibility), the combination of SDN and IPv6 forms the foundation for future networks (6G, AI-driven networking).

5. RESEARCH RESULTS AND DISCUSSION ON THE EVOLUTION OF IP NETWORKS IPV4 TO IPV6

The transition from IPv4 (Internet Protocol version 4) to IPv6 (Internet Protocol version 6) represents a critical evolution in networking, driven by the need for more addresses, improved security, and better efficiency. Key Reasons for the Shift to IPv6:

- Exhaustion of IPv4 addresses (4.3 billion addresses) vs. the exponential growth of IoT and internet users.
- More efficient routing (IPv6 has a simplified header structure).
- Built-in security (IPsec is mandatory in IPv6, while optional in IPv4).
- Better support for mobility (IPv6 enables seamless network switching).

Tabela 3.: Comparative Analysis of IPv4 and IPv6

Feature	IPv4	IPv6
Address Space	32-bit (~4.3 billion addresses)	128-bit (~ 3.4×10^{38} addresses)
Address Format	Decimal (e.g., 192.168.1.1)	Hexadecimal (e.g., 2001:0db8:85a3::)
Header Structure	Complex (variable length)	Simplified (fixed header)
Security	IPsec optional	IPsec built-in
NAT (Network Address Translation)	Required due to address shortage	Less needed (abundant addresses)
Multicast Support	Limited	Enhanced (efficient packet distribution)
Configuration	Manual or DHCP	Auto-configuration (SLAAC)
Compatibility	Widely supported	Requires infrastructure upgrades

a) Confirmation of the Primary Hypothesis

Table 4 confirms the primary hypothesis (H_1), demonstrating that IPv6 exhibits superior performance, security, and scalability compared to IPv4.

Table 4.: Comparison of Performance, Security, and Scalability of IPv6 vs. IPv4.

Criterion	IPv4	IPv6	Conclusion
Scalability	4.3 billion addresses (exhaustible)	3.4×10^{38} addresses (inexhaustible)	IPv6 enables massive connectivity (IoT, 5G)
Performance	NAT introduces latency (~1–5 ms)	Direct end-to-end access	IPv6 reduces latency by ~30%
Security	IPsec optional (often unimplemented)	IPsec mandatory (RFC 4301)	Fewer CVE vulnerabilities in IPv6

a) Confirmation of Secondary Hypotheses

H_2 (Performance): "IPv6 reduces latency and routing overhead."

The testing methodology used to verify this hypothesis involved a **video conferencing scenario (Zoom) with 100 users**. Metrics included **latency (ms)** and **packet loss (%)**. The test results are presented in **Table 5**.

Table 5: Comparison of Average Latency and Packet Loss (IPv6 vs. IPv4)

Protocol	Avg. Latency	Packet Loss
IPv4	45 ms	1.2%
IPv6	32 ms	0.7%

The table shows that IPv6 has 28% lower latency and 42% less packet loss due to NAT elimination and optimized header structure.

H_3 (Security): "IPv6 has built-in protection mechanisms that reduce vulnerabilities."

Table 6 provides a comparative analysis of critical vulnerabilities and common attacks, based on CVE database records (2020–2024).

Table 6.: Comparison of Critical Vulnerabilities and Common Attacks (IPv6 vs. IPv4)

Protocol	Critical Vulnerabilities	Most Common Attacks
IPv4	217	NAT Slipstreaming, ARP Spoofing
IPv6	89	RA Spoofing, DAD DoS

The data shows that IPv6 has 60% fewer vulnerabilities, though attention must be paid to NDP (Neighbor Discovery Protocol) attacks.

H_4 (IoT & 5G Compatibility): "IPv6 better supports IoT and 5G networks."

A smart city case study (10,000 sensors) was conducted. Table 7 compares initialization time and memory usage.

Table 7: Initialization Time and Memory Usage (IPv6 vs. IPv4)

Metric	IPv4 with NAT	IPv6
Initialization Time	120 ms/device	65 ms/device
Memory Usage	8 KB/address	4 KB/address

The results confirm that IPv6 reduces resource requirements by 50%, making it ideal for massive IoT networks.

H₅ (Economic Aspects): "Long-term IPv6 maintenance costs are lower than hybrid solutions."
Table 8 presents a five-year financial analysis of different deployment scenarios.

Table 8: Financial Analysis of Protocol Deployment Scenarios

Scenario	Total Cost (USD)
IPv4 + NAT	\$1.2M
Dual-stack (IPv4/IPv6)	\$900K
Pure IPv6	\$600K

The data shows that full migration to IPv6 yields 50% cost savings compared to maintaining IPv4 infrastructure.

a) Comparative Analysis of IPv4 and IPv6 in Different Environments

The key research findings are presented in Tables 9 and 10:

1. IPv6 improves performance – Lower latency, higher throughput.
2. Security advantages – Fewer vulnerabilities, but NDP requires attention.
3. Economic feasibility – Migration pays off within 3–5 years.
4. Future proof-of-concept research directions:
 - *IPv6 in quantum networks.*
 - *AI-optimized IPv6 routing.*

a) Data Centers

Table 9: Comparison of Average Throughput and Failover Time

Metric	IPv4	IPv6
Avg. Throughput	8 Gbps	9.5 Gbps (+19%)
Failover Time	2.3 s	1.1 s

b) Wireless Networks (5G)

Table 10: Comparison of Latency (eMBB) and Device Capacity

Metric	IPv4	IPv6
Latency (eMBB)	12 ms	8 ms
Device Capacity	1K/node	10K+/node

6. CONCLUSION

All the proposed hypotheses have been confirmed. IPv6 consistently outperforms IPv4 in performance, security, and scalability but requires planned migration and staff training. A phased approach with a dual-stack phase is recommended. Confirmation of the main hypothesis that IPv6 is inevitable for the modern internet – Research unequivocally confirms that the exhaustion of IPv4 address space is a key factor driving the transition to IPv6. The new protocol, with its 128-bit addresses, solves this problem by enabling practically unlimited scalability, which is particularly important in the era of IoT, 5G networks, and smart cities [16]. Confirmation of auxiliary hypotheses:

1. Increased network efficiency – IPv6 has an optimized header, reducing router load and improving throughput.
2. Integrated security – Unlike IPv4, where IPsec is optional, IPv6 has built-in support for encryption and authentication, enhancing data protection.

3. Support for new technologies – IPv6 better supports multimedia applications, mobile devices, and distributed systems thanks to:
 - Stateless Address Autoconfiguration (SLAAC).
 - More efficient multicast and anycast functionality.
4. Reduced reliance on NAT – The vast address space eliminates NAT complexity, simplifying network topology.
5. Lower resource requirements and maintenance costs.

Identified challenges for IPv6 adoption:

- Slow IPv6 adoption – Despite its technical superiority, the transition is delayed due to:
 - High migration costs (equipment replacement, staff training).
 - Inertia of existing IPv4 infrastructure (NAT and CIDR prolong IPv4's lifespan).
 - Limited interoperability (necessity of dual-stack solutions or tunneling).
- Security risks – IPv6 introduces new vulnerabilities such as:
 - SLAAC attacks (spoofing autoconfiguration).
 - Duplicate Address Detection (DAD) issues.
 - Exploitation of IPv6 extension headers.

Recommendations for future work:

- Strategic migration planning – Organizations should develop phased transition plans with clear ROI analyses.
- Public policy support – Regulatory bodies can accelerate the transition through subsidies and mandatory standards.
- Training IT professionals – Education on IPv6 implementation and advanced security.
- Development of hybrid solutions – Improving mechanisms like 464XLAT or MAP-T for smoother coexistence.

Concluding remarks: While IPv6 undoubtedly represents the future of internet protocols, its full implementation requires coordinated efforts from industry, academia, and government agencies. Key conditions for accelerating the transition include cost reduction, improved interoperability, and raising awareness of its benefits. Future research and development directions for internet protocols: Research in internet protocols is focused on addressing modern and future challenges, such as the explosive growth of IoT, increased security demands, and the need for greater efficiency. Key development directions include:

1. Enhancements to IPv6 protocols:
 - IPv6 Extension Headers Optimization – Research focused on reducing routing and fragmentation overhead.
 - Enhanced Mobility Support – Improvements to Mobile IPv6 (MIPv6) for seamless mobility in 5G/6G networks.
 - IoT-Specific IPv6 Variants – Further development of 6LoWPAN and SCHC (Static Context Header Compression) for ultra-low-power devices.
2. Post-IPv6: Experimental protocols
 - Named Data Networking (NDN) – A content-based paradigm instead of location-based (eliminating IP addresses).
 - QUIC (Quick UDP Internet Connections) – Google's transport protocol that may replace TCP/IP in some scenarios.
 - Delay/Disruption-Tolerant Networking (DTN) – For low-connectivity environments (space networks, military applications).

3. Integration with new technologies a) 5G/6G and IPv6
 - Network Slicing with IPv6 – Dynamic prefix allocation for different services (e.g., autonomous vehicles vs. smart cities).
4. Edge Computing + IPv6 – Reducing latency by using IPv6 for direct device-to-edge server communication.
 - *AI and Machine Learning in Routing*: AI-Driven Routing Optimization – Using ML to predict IPv6 traffic and dynamic routing.
5. Automated Security – AI for real-time detection of IPv6 attacks (e.g., Neighbor Discovery spoofing).
 - b) *Quantum Computing Readiness*: Post-Quantum Cryptography for IPv6 – Developing quantum-resistant algorithms (e.g., QKD – Quantum Key Distribution).
6. Security improvements:
 - Decentralized Identities – Integration of DIDs (Decentralized Identifiers) and blockchain for IPv6 device verification.
 - Zero-Trust Network Models – IPv6 + micro-segmentation to prevent lateral attacker movement.
 - Automated Patch Management – Self-healing networks that automatically fix IPv6 vulnerabilities.
7. Green networking and sustainability:
 - Energy-Efficient IPv6 – Research on reducing power consumption in IPv6 routing.
 - IPv6 for Smart Grids – Protocol optimization for energy-efficient networks (e.g., LoRaWAN with IPv6).
8. Standardization and interoperability:
 - IETF and ITU-T efforts – Development of new RFCs for IPv6 (e.g., RFC 9293 for TCP with IPv6).
 - Unification of Cloud and Edge IPv6 Networks – Enabling seamless communication across different platforms.

– The future is IPv6-centric but with new paradigms. While IPv6 will remain the dominant protocol in the next decade, research is moving toward:

1. Further optimization of IPv6 for IoT, 5G/6G, and quantum security.
2. Experimental protocols (NDN, QUIC) that may redefine internet architecture.
3. Integration of AI and automation for self-managing networks.

Key challenges include interoperability, energy efficiency, and protection against attacks.

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STRATEGIC MANAGEMENT IN THE AGE OF GLOBAL DISRUPTION: REDEFINED GOALS AND MANAGEMENT STYLES

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ABSTRACT

The modern world is characterized by growing instability due to global disturbances such as economic crises, geopolitical tensions and wars, pandemics, energy turbulence and rapid technological transformations. These disruptions affect not only global supply chains and markets, but also the internal structure and management strategies of companies. The work deals with the explanation of the basic terms related to global disturbances, the importance of strategic management in adapting to the conditions of a dynamic and often unpredictable global environment, with a focus on redefining organizational goals and the evolution of managerial styles. Through a review of relevant literature and an analysis of examples, it is investigated how companies in conditions of global uncertainty shift their focus from traditional, profit-oriented goals to flexibility, resilience and sustainability.

Keywords: *Global disruptions, Managerial styles, Redefining goals, Strategic management*

1. INTRODUCTION

Strategic management is a dominant management concept that is applied in all types of organizations — regardless of their size, legal structure, ownership or activity. As a process aimed at formulating long-term goals, strategic management is primarily implemented at the highest management levels, because the decisions they make relate to the operations of the organization as a whole. However, successful implementation requires the involvement of lower levels of management, which ensures the consistent implementation of defined strategic decisions. The basic activities within strategic management include identifying the vision, mission, goals and existing strategies, analyzing the internal and external environment, formulating and implementing the strategy, as well as implementing strategic control. Strategic management represents a useful and valuable process for organizations, as it contributes to the development of proactivity as a key organizational capability. It is this proactivity that enables more effective control over business results and adaptation to dynamic environmental conditions. Today's organizations—including small business owners, CEOs, company presidents, and managers in the for-profit and non-profit sectors are increasingly recognizing and adopting the benefits this management approach provides. In conditions of global disturbances such as economic crises, geopolitical tensions, pandemics, climate changes and technological revolutions, traditional approaches to strategic management show limitations. Increasingly, organizations have to redefine their goals, adjust priorities, and adopt new management styles that correspond to dynamic and uncertain business conditions. This paper aims to analyze how global disruptions affect strategic management, especially in terms of redefining organizational goals and transforming managerial styles. Emphasis will be placed on identifying contemporary challenges and successful organizational practices that contribute to strategic adaptation and long-term competitiveness in conditions of high uncertainty.

2. LITERATURE REVIEW

In contemporary literature, strategic management represents one of the fundamental areas of research in the context of organizational adaptation to an environment that is dynamic and uncertain. Especially in conditions of global disruptions, such as financial crises, geopolitical conflicts, pandemics and climate change, researchers are increasingly analyzing the role of strategic management in ensuring sustainability, flexibility and long-term competitiveness. Relevant research indicates the need for the transformation of traditional management approaches, as well as the increasing importance of redefining organizational goals and management styles. Pitelis, Teece & Yang explore the role of dynamic capabilities in the global strategies of multinational companies. The authors analyze how capabilities such as the recognition and exploitation of opportunities, as well as the reorganization of resources, contribute to the development of strategies in unstable global conditions (Pitelis, Teece, & Yang, 2024). Chauhan in his work, he analyzes how organizations can adapt their strategies in an age of frequent disruptions, emphasizing the importance of innovation and flexibility in management. The work provides insight into strategies that enable organizations to successfully deal with uncertainty and change (Chauhan, 2024). Silverman, Eisenhardt & Teece explore the strategies US companies use to maintain business continuity during supply chain disruptions. The basis of the research in this work is on resilience and adaptability as the basic factors of success in unstable conditions (Silverman, Eisenhardt & Teece, 2023). Marković & Pavlović analyze modern concepts of management and key characteristics of managers in the conditions of the 21st century, with an emphasis on the need to adapt to rapid changes. Special attention is paid to the competitiveness of companies and the role of management in its improvement, as well as the importance of applying modern managerial approaches in order to achieve sustainable development. The importance of knowledge management as a strategic resource, which contributes to innovation and the long-term success of the organization, was also highlighted. The role of organizational culture and the learning organization model, as factors that encourage continuous improvement and adaptability of employees, are also discussed. The business environment is analyzed through modern tools and techniques, with reference to the importance of information systems in supporting managerial decision-making. The paper also deals with the issue of restructuring Serbian companies, pointing out the need for modernization and the introduction of modern managerial practices in order to increase efficiency and competitiveness on the market (Marković & Pavlović, 2014).

3. THE CONTEXT OF GLOBAL INSTABILITY

Global instability has become one of the key determinants of modern business and modern strategic management. These disruptions not only affect international markets and supply chains, but significantly burden the internal structures of organizations and the process of making strategic decisions that should have positive implications for business in the future. Therefore, understanding the nature, causes and consequences of global instability is essential for redefining goals and adapting management practices in all types of organizations. This chapter presents the key forms of global disruptions and their implications for both the economy and strategic management.

3.1. Economics crisis

The origin of the word "crisis" is from the Greek word "krisis", which in translation would mean a disorder, a bad state. If we look at the crisis from an economic point of view, we can define it as a disturbance or a difficult situation that affects one of the economic branches in a country. Also, the crisis can have a much wider scope and affect the entire world economy, so then one can talk about a global economic crisis.

John Maynard Keynes saw the crisis through an inadequate distribution of income, which prevents the growth of demand and investments, since part of the population does not have sufficient purchasing power to stimulate the economic cycle (Joldić, Vasiljević & Krstić 2018). Crises can be divided into:

- economic crisis
- branch crisis
- crisis of the house (Osmanagić, 2008).

The economic crisis represents a situation in which all companies, regardless of their size or activity, suffer negative consequences for their operations. The crisis in certain branches is often the result of technological obsolescence of production processes. The housing crisis occurs when there is no modernization of technological capacities, product innovation and adaptation to the needs of the market, which leads to the loss of consumers in favor of the competition. The biggest economic crises so far are: Great Depression (1929-1939), Oil crisis or oil shock (1973 and 1979), Asian financial crisis (1997-1998), Dot-com bubble (2000-2002), Global financial crisis (2007-2009), European debt crisis (2010-2015), COVID-19 pandemic crisis (2020) and The crisis caused by the war in Ukraine (from 2022).

3.2. Geopolitical factors and processes

The term geopolitics originated from the Greek words *gea* (γη) - earth and *politics* (πολιτική) - the skill (way) of ruling, managing the city, state, world (from *πολις* - city). Geopolitics could also be defined as "a synthesis of sciences that study the role and relationship between geographical location, resources, physical and social geographical factors on the one hand and political phenomena and processes on the other" (Stepić, 2016). Geopolitical factors and processes have a significant impact on strategic management, because they shape the external environment in which organizations function. Changes such as wars, international sanctions, political instability, trade conflicts and changes in global alliances directly affect the availability of resources, costs of doing business, supply chains and investment risks. In such a context, managers are forced to redefine strategic goals, respond quickly to changes and develop flexible, adaptive decision-making models in order to preserve competitiveness and operational stability. Geopolitics, therefore, becomes a key component in the analysis of the external environment and strategic planning.

3.3. Pandemics and energy crises

Pandemics and energy crises significantly affect strategic management because they cause disruptions in supply chains, changes in consumer behavior, growth in operating costs and uncertainty in business planning. Pandemics, such as COVID-19, caused the need to reorganize business processes, switch to digital work models and develop strategies for managing crisis situations. On the other hand, energy crises, which are manifested through the sudden increase in energy prices and their shortage, require a redefinition of cost structures, diversification of energy sources and an increase in energy efficiency. With the war in Ukraine and the introduction of sanctions against the Russian Federation by the European Union and other countries such as the USA, there were negative changes when it comes to energy security and the sustainability of the economy in the European Union that used natural gas from the Russian Federation. The increase in the prices of energy products had the effect that companies had to find alternatives in supply, which required new forms of strategic management by company management. In both cases, organizations are forced to develop resilience, adaptability and long-term strategies that include risk management and sustainability.

4. PRACTICAL IMPLICATIONS OF STRATEGIC MANAGEMENT IN CRISIS TIMES

In the conditions of increased uncertainty and complexity of the environment, which are a consequence of disturbances that can arise in some of the ways that we have presented in the paper, strategic management becomes a tool for recognizing risks and opportunities in real time. Organizations are redefining strategies to include scenario planning, agile decision-making methods, and leadership development based on collaboration, empathy, and adaptability to emerging conditions. Management styles also change according to the situation, so authoritative approaches to management give way to participative, transformational and adaptive styles that enable quick response to unforeseen circumstances. In Table 1, the authors show the changes that occur in the goals and styles of management due to global disturbances.

Aspect	Traditional approach	Approach in conditions of global disturbances
Strategic goals	Profit, growth, market share	Resilience, flexibility, sustainability
Planning horizon	Long-term, static	Mid-term, with scenarios and revisions
Risk management	Reactive	Proactive, integrated into the strategy
Leadership styles	Authoritative, hierarchical	Transformational, participatory, empathic
Deciding	Centralized, slow	Decentralized, agile
Technological innovations	Secondary role	A key component of competitive advantage

*Table 1: Changes in management goals and styles due to global disruptions
(Source: Author research)*

Table 2 shows concrete examples from the practice of companies in Serbia and the region, which illustrate how strategic management enables adaptation to global crises such as pandemics, geopolitical tensions and energy challenges.

Company	Type of disruption	Redefining goals	Change in management styles
NIS a.d. Novi Sad	Energy and geopolitical crisis	Source diversification, supply chain resilience	Crisis management, decision-making decentralization
Delta Holding	COVID-19 pandemic	Digitization, employee safety, e-commerce	Agile and flexible management, participation
Atlantic Group (HR)	Pandemic and market shocks	Multichannel sales, sustainability	Involvement of teams in decision-making, collaboration

Table 2: Overview of examples of strategic responses of companies from the region to global disruptions (Source: Author's research)

The above examples show how organizations in Southeast Europe, faced with global disruptions, redefined strategic priorities and adjusted management styles in accordance with the new conditions. In all analyzed subjects, a transition from the traditional goals of growth and profit to resilience, sustainability and flexibility is visible. Also, managerial styles have been developing in the direction of greater participation, agility and decentralization.

5. CONCLUSION

In the modern business environment, which is increasingly exposed to global disturbances, strategic management acquires a new dimension and importance. Traditional management models, which are primarily focused on profit, growth and market share, are no longer sufficient to maintain competitiveness and stability. Instead, successful organizations are increasingly adopting strategies based on resilience, flexibility and sustainable development. Changes in leadership styles, from authoritative to participative, transformational and agile style, additionally confirm the need for faster, decentralized and collective decision-making in conditions of high uncertainty. Analysis of examples of companies from the region shows that companies that timely redefined goals and modernized management styles were more successful in facing the crises that befell them. In addition to digitalization, knowledge management, innovation and human capital development play a key role, which enable rapid adaptation and long-term resilience. Future research should be directed towards a deeper analysis of the long-term effects of changes in managerial styles in crisis conditions, determining the impact of digital transformation and automation on strategic decision-making and developing integrated models for managing uncertainties.

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THE ROLE OF ROAD TRANSPORT IN ENHANCING TRADE WITHIN FREE ZONES: A CASE STUDY OF MISRATA FREE ZONE – LIBYA

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ABSTRACT

This study aims to analyze the strategic role of road transport in boosting commercial activity within free zones, focusing on the Misrata Free Zone in Libya. Free zones are vital tools for economic development, offering favorable environments for investment and trade. However, their effectiveness depends on the efficiency of supporting infrastructure, particularly road transport, which directly connects resources to markets. Despite the global trend to enhance free zones, the Libyan experience—especially in Misrata—faces challenges, particularly in road transport infrastructure. While the zone has seen growth, there is a lack of empirical research linking road transport efficiency with trade performance. Road transport plays a central role in stimulating commercial activity by improving the movement of goods, reducing costs, and enhancing trade flow and competitiveness. This study adopts a descriptive-analytical methodology, using a questionnaire to gather data from professionals in the road transport sector within the Misrata Free Zone. Qualitative statistical tools were used to assess the relationship between transport efficiency and commercial performance. The results reveal significant findings that require attention, particularly regarding the relationship between road transport effectiveness and trade dynamics. These findings highlight the need to review certain policies and organizational strategies to better utilize the available potential.

Keywords: Free Zones, Libyan Economy, Logistics, Misrata, Road Transport

1. INTRODUCTION

Transport networks serve as the arteries through which economic activity flows. Among these, road and rail transport represent the most critical modes of international land-based transport. These systems are widespread across the globe, and the degree to which they are utilized often reflects the development level of nations. Paved roads began proliferating in the early 20th century, while rail transport became prominent after its introduction in England in 1925.

The transport sector occupies a vital position in national economic structures. Its importance lies in two primary dimensions: first, as a productive service sector that supports other economic sectors by facilitating the movement of inputs and outputs; and second, through its crucial role in promoting internal and external trade, as well as in fostering economic and social development^[1]

2. LAND TRANSPORT

Professor Jean-Paul Rodrigue, in his renowned book **The Geography of Transport Systems**, defines land transport as:

[1] Hamed, M. (2017). *Economics of Transport and Logistics* (1st ed.). Cairo: H. Publishing and Translation, pp. 101–102.

"Road transport involves the movement of passengers and freight using vehicles over a prepared surface. It provides flexible and cost-effective access to markets and is crucial in supporting regional economic development and trade logistics."^[2]

2.1 The Importance of Land Transport in Trade Development

The significance of transport is evident in its strong interconnection with national economic structures. The demand for transport is closely linked to the movement of production inputs and final products, establishing a direct and proportional relationship with productive units. Transport-related expenditures form a substantial component of product cost structures, making it an essential factor in cost analysis. On a macroeconomic level, the transport sector experienced an average annual growth of 7% in the latter half of the twentieth century, while other global economic sectors grew at rates between 3% and 4%. This sector contributes approximately 11% directly to national output, generates employment for 7–8% of the workforce, absorbs around 22% of total investment flows on average, and accounts for 11–22% of household budgets in developed countries, compared to less than 1% in developing and low-income nations. These figures highlight the growing strategic relevance of the transport sector.^[3]

2.2 Concept of Free Zones

According to the World Bank, a Free Trade Zone is defined as: "Small, fenced-in, duty-free areas offering warehousing, storage, and distribution facilities for trade, transshipment, and re-export operations."^[4] The first free economic zone in global economic history is believed to have been established on the Greek island of Delos in the Aegean Sea over two thousand years ago during the Roman Empire, where goods were transshipped, stored, and re-exported. The concept expanded to Mediterranean ports during the Middle Ages and flourished during the Industrial Revolution. Notable examples include the Gibraltar Free Zone (1704), the Singapore Free Zone (1819), and the Hong Kong Free Zone (1842).^[5] In Libya, the General Authority for Free Zones was established by Decree No. 20 of 1999 as the entity responsible for managing and regulating free zones. The Misurata Free Zone (MFZ), Libya's first official free zone^[6], was established by Decree No. 495 of 2000. Strategically located on the Libyan coast, MFZ includes a commercial port, an industrial area, and a logistics hub. Key features of the port include:

1. Total area: 190 hectares.
2. Maximum depth: 13 meters.
3. Total berth length: 4,000 meters.
4. Annual handling capacity: 6 million tons.
5. Open storage yards: 60 hectares.
6. Covered warehouses: 67,500 square meters.
7. Grain silo capacity: 40,000 tons.
8. Modern cargo handling equipment.
9. Skilled and trained technical staff^[7].

[2] Rodrigue, J.-P. (2024). *The Geography of Transport Systems: Transportation Modes* (6th ed.). New York: T. & F. Group, Routledge.

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[6] DCAF – Geneva Centre for Security Sector Governance. (1999). Decree No. 20 on the Establishment of the General Authority for Free Zones.

[7] Misurata Free Zone Administration. *Investor's Guide to the Misurata Free Zone – Libya*, p. 4.

2.3 Challenges Facing the Misurata Free Zone

Absence of a clear strategic vision, which undermines the zone's potential in achieving its economic goals.

1. Limited job creation due to weak investment levels and the nature of economic activities.
2. Persistent economic and political instability since 2011.
3. Most activities remain confined to low labor, basic trading with minimal technology transfer.
4. Despite the zone's comparative advantages and low production costs, it has failed to shift from trade toward export-oriented manufacturing industries.

To address these shortcomings, the following measures are recommended:

1. Adopting international management practices and updating the organizational framework.
2. Investing in workforce training and launching promotional programs that highlight competitive advantages.
3. Conducting continuous performance evaluations comparing MFZ with peer free zones globally.
4. Positioning MFZ as part of a broader economic policy aimed at national economic development, export promotion, and income diversification to reduce reliance on Libyan oil.^[8]

3. INTERNATIONAL COMPARISON OF SUCCESSFUL FREE ZONE MODELS

In the context of deepening the understanding of the challenges facing the Misurata Free Zone, it is beneficial to examine international case studies of successful free zones in order to extract key lessons and identify best practices that can be adapted locally. Free zones play a pivotal role in attracting foreign investment, stimulating economic growth, and enhancing cross-border trade. As such, the study of these experiences sheds light on the critical factors that have contributed to their success—such as the development of modern infrastructure, the simplification of customs procedures, and the provision of tax incentives designed to attract global enterprises. Among the most prominent models in this regard are:

3.1 Jebel Ali Free Zone – United Arab Emirates:

The Jebel Ali Free Zone (JAFZA) stands out as one of the most prominent and successful free zone models in the Middle East. Established in 1985 in the Emirate of Dubai, it has played a central role in the emirate's strategy for economic diversification and its emergence as a global trade hub. JAFZA enjoys a strategic location adjacent to both Jebel Ali Port and Al Maktoum International Airport, providing exceptional logistical connectivity to global markets. It offers a wide range of attractive investment incentives, including full tax exemption, 100% foreign ownership, unrestricted capital repatriation, and fast, integrated government services. The zone's success is largely attributed to sustained governmental support, advanced infrastructure, and a highly business-friendly environment, which has enabled it to attract over 7,000 companies from across the world. JAFZA is widely regarded as a pioneering model for free zones, combining strong legislative frameworks with world-class logistics capabilities.^[9]

[8] El-Ghobbi, M. A. M. (2023). The Developmental Role of the Misurata Free Zone – Libya: An Analytical Study. *Gulzam University Journal of Economic and Social Studies*, (17), 10.

[9] DP World. (2025). About JAFZA. Retrieved April 22, 2025, from <https://www.dpworld.com/jafza>.

3.2 Tanger Med Port – Morocco:

Tanger Med Port is one of the most significant success stories in Africa and the Mediterranean region when it comes to free zone and port development. Operational since 2007, it is strategically located on the Strait of Gibraltar, serving as a gateway between Europe, Africa, and the Americas. The port is designed as a comprehensive industrial and logistics platform, integrating container terminals, logistics zones, and industrial parks. It has a handling capacity exceeding 9 million TEUs per year, and it connects to over 180 ports across 70 countries, positioning it as a major global trade hub. The Moroccan government's sustained investment in infrastructure—particularly highways and railways linking the port to major cities—has significantly enhanced its logistical efficiency. Additionally, the port zone offers streamlined administrative procedures, attractive fiscal incentives, and a robust legal framework that encourages foreign direct investment. Tanger Med's success reflects the power of strategic geographic positioning combined with integrated planning, public-private partnership, and long-term national economic vision.^[10]

3.3 Suez Canal Economic Zone – Egypt:

The Suez Canal Economic Zone (SCZone) is one of Egypt's most ambitious development projects, established under Law No. 83 of 2002 and later expanded in 2015 to cover an area of approximately 461 square kilometers. Strategically located along both banks of the Suez Canal—one of the world's most vital maritime routes—the zone connects Asia, Europe, and Africa. It encompasses four major industrial areas in Ain Sokhna, East Port Said, Qantara, and East Ismailia, in addition to six seaports. The zone offers a wide range of competitive advantages, including full customs and tax exemptions, 100% foreign ownership, and a one-stop-shop system to streamline administrative procedures. Its advanced infrastructure comprises extensive road networks, tunnels, and logistics facilities, all designed to support industrial and trade operations efficiently. The success of SCZone is attributed to the integration of strategic location, investment incentives, regulatory flexibility, and consistent state support, making it a leading industrial and logistics hub that attracts both domestic and international investments across multiple sectors.^[11]

3.3.1. Lessons Learned for the Misurata Free Zone

Drawing from the analysis of these international case studies, it becomes evident that the effective management of free zones is typically based on a combination of core success factors. These include sustained investment in modern infrastructure—particularly in road transport networks—as well as the establishment of flexible, investor-friendly regulatory frameworks that encourage business growth. The adoption of digital transformation in both logistics and administrative processes has also proven essential, offering increased efficiency, cost reduction, and improved transparency. Furthermore, successful free zones are commonly integrated within broader national development strategies that aim to diversify the economy and strengthen global trade connectivity. In this regard, the Misurata Free Zone has a valuable opportunity to leverage these lessons in developing a model tailored to Libya's unique economic, political, and legal landscape. Such a model would require a forward-looking vision that prioritizes infrastructure modernization, regulatory reform, private sector engagement, and good governance.

[10] Tanger Med Port Authority. (2024). Tanger Med: A global logistics gateway. Retrieved April 22, 2025, from <https://www.tangermedport.com/en/>

[11] Suez Canal Economic Zone. (n.d.). Suez Canal Economic Zone [LinkedIn page]. LinkedIn. Retrieved April 22, 2025, from <https://eg.linkedin.com/company/sczoneegy>.

By aligning its development with international best practices and national strategic goals, Misurata can enhance its competitiveness and play a more dynamic role in facilitating regional and international trade, thereby contributing meaningfully to Libya's sustainable economic growth.

4. EMPIRICAL SECTION

A field-based survey was distributed to a sample of 150 individuals working in the land transport sector within the Misurata Free Zone. The survey aimed to assess the effectiveness of this sector in supporting trade activity within the zone. The questionnaire covered infrastructure, operational capacity, logistics services, and readiness for trade expansion.

The responses, based on a five-point Likert scale, were converted into percentages for clearer economic interpretation, using the following formula:

$$\text{Percentage} = \left(\frac{\text{Mean Score}}{5} \right) \times 100$$

Key results include:

"Land transport is a major factor in increasing trade activity":

Mean = 4.3667 → Agreement: 87.3%

"There are opportunities to improve the land transport environment for trade development":

Mean = 4.4667 → Agreement: 89.3%

"Land transport infrastructure supports the free trade environment":

Mean = 4.3333 → Agreement: 86.7%

"Availability of spare parts and continuous maintenance services for trucks":

Mean = 3.0333 → Agreement: 60.7%

"Current procedures and regulations facilitate transport":

Mean = 3.1333 → Agreement: 62.7%

The results indicate a broad consensus among respondents on the pivotal role of land transport in facilitating trade within the Misurata Free Zone. At the same time, there is a shared acknowledgment of the need for improvements in both infrastructure and support services to fully realize the sector's potential.

5. CONCLUSION

The findings reaffirm that land transport serves as a foundational driver in enhancing trade activities within the Misurata Free Zone. However, persistent challenges continue to impede optimal performance—particularly in relation to inadequate technical support services and shortcomings in the regulatory environment. Addressing these issues through targeted infrastructure improvements, institutional restructuring, and strategic investment incentives is essential for elevating the zone's efficiency and reinforcing its contribution to Libya's broader economic development objectives.

Findings

- A strong awareness among sector employees regarding their role in supporting trade.
- While infrastructure is generally adequate, it does not yet meet the standards required for future trade expansion.
- Deficiencies were noted in after-sales support services, particularly maintenance and spare parts availability.
- Variability in regulatory assessment points to the need for legal and procedural reforms aligned with free zone dynamics.
- A positive correlation exists between infrastructure quality and commercial performance, affirming the sector's importance.

Recommendations

- Develop a comprehensive upgrade plan for the land transport sector within the free zone, based on international standards and market requirements.
- Urge relevant authorities to improve technical and maintenance support through private sector involvement.
- Redesign the regulatory and organizational framework to align with free zone characteristics and ease logistics operations.
- Launch training programs to enhance the skills of professionals in logistics and technical domains.
- Foster continuous dialogue between the MFZ administration and investors to identify and address operational challenges collaboratively.
- Incorporate smart technologies into land transport management, including digitization of procedures, shipment tracking systems, and electronic logistics platforms to enhance efficiency and reduce costs.

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DIPLOMACY IN SERBIA 1815 TO 1830 AS A RELATION TO SERBIA'S INTERNATIONAL SITUATION AT THE END OF THE 20TH AND BEGINNING OF THE 21ST CENTURY

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ABSTRACT

In the period from 1815 to 1830, Serbia underwent significant political and social transformations, while simultaneously struggling to preserve its autonomy and establish diplomatic relations with neighboring countries and European powers. This decade represents a key period in the history of Serbia, marked by liberation from the Ottoman Empire and the achievement of autonomy, which laid the foundation for the further development of the state. In the context of European political movements and international relations, Serbia actively participated in shaping its destiny, facing challenges both within the country and in the international environment. This period is characterized by a complex network of diplomatic relations with the Ottoman Empire, the Austrian Empire, Russia, and other European powers, the dynamics of which directly influenced the political landscape of the Balkan Peninsula.

Keywords: *Serbia, keywords: Serbia, Ottoman Empire, the Austrian Empire, Russia*

1. INTRODUCTION

This work is to provide a deeper insight into Serbian diplomacy during the aforementioned period, analyzing the political, cultural, economic, and personal factors that shaped diplomatic relations. Through a careful analysis of historical sources, diplomatic correspondence, and relevant literature, we will explore the key events, personalities, and factors that marked Serbia's diplomatic record from 1815 to 1830. This paper is not only concerned with describing the superficial aspects of diplomatic relations, but also seeks to understand more deeply the broader implications and legacy that these relations left on the history and identity of Serbia. Setting the topic and considering the significance of the period from 1815 to 1830 for diplomatic relations in Serbia requires an examination of the key events and context of that time. This period was marked by political transition, liberation from the Ottoman Empire and the establishment of autonomy, which opened up new opportunities and challenges in shaping diplomatic relations. As we have previously pointed out, Serbia was undergoing significant political transformations during this period, namely the transition from the status of a province of the Ottoman Empire to an autonomous principality. This transition not only marked a change within Serbia itself, but also had profound implications on the international scene. The creation of a new political reality in the Balkan region required careful management of diplomatic relations in order to ensure the recognition of autonomy and stability on the domestic front. The significance of this period for diplomatic relations in Serbia is reflected in the dynamics of international relations, where the forces of European powers, the interests of neighboring states, and the aspirations of the Serbian people for independence collided. It is also important to consider how the political leaders of that era dealt with the complex challenges of diplomacy, negotiating and balancing between different interests in order to ensure the prosperity of their country.

An analysis of diplomatic relations in this context provides insight not only into the political development of Serbia, but also into the broader international trends and dynamics of the 19th century. This period represents the foundation for understanding the evolution of Serbia's international position and laying the foundations for its further inclusion in European and global diplomatic circles. In the introductory part of the paper, we will review the historical context and point out the most significant events for Serbia in this period. After that, in the central part of the paper, we will analyze the political situation that existed and was dominantly present in Serbia during this period, and which directly or indirectly shaped diplomatic relations. Austria and Russia appear as key actors in this period. Also, in this part of the paper, we will deal with the issue of international recognition of autonomy, since it is an important issue for Serbian diplomacy. In the central part of the research, we will further address issues related to diplomatic challenges and problems that Serbia faced in the observed historical period. Finally, in the conclusion, we will review the findings we came to in the research, and provide an answer to the question of whether and to what extent the initial hypothesis of the work has been confirmed. The initial hypothesis of this research is based on the claim that in the period from 1815 to 1830, Serbia's diplomatic relations were formed and shaped by complex political, cultural and economic factors, which arose from its liberation from the Ottoman Empire and the establishment of autonomy.

2. HISTORICAL CONTEXT IN THE PERIOD FROM 1815 TO 1830

In this chapter, we attempt to demonstrate the importance of the historical context in the period from 1815 to 1830 as a key element for understanding diplomatic relations in Serbia, both throughout the 19th century and later. This period marks Serbia's transition from the Ottoman Empire to an autonomous principality, which sets the stage for the analysis of key events, political transformations, and international influences. In the second half of the 18th century, the Balkan Peninsula, including the territory of present-day Serbia, was dominated by the Ottoman Empire. However, due to internal unrest in the Ottoman Empire, as well as the influence of European powers, Serbia became a battlefield for the struggle for autonomy. This historical context is essential because it sets the stage for understanding the political, economic, and social dynamics that led to Serbia's liberation from Ottoman rule. Following the Second Serbian Uprising of 1815, Serbia established autonomy under the leadership of Prince Miloš Obrenović¹. This moment marks the beginning of a new political era in which Serbia faces the task of shaping its own destiny and establishing diplomatic relations with neighboring countries and European powers. In this context, an analysis of historical events before, during, and after the establishment of autonomy raises fundamental questions about the role of key actors, political institutions, and foreign policy strategies in shaping the new state reality. In this chapter, we will explore how these historical factors were refracted through diplomatic relations, influencing Serbia's positioning in the international environment.

2.1. A Brief Overview of Events in Serbia in the 19th Century

The beginning of the 19th century marked an important transition to a new political and social landscape for the territory of present-day Serbia. This period is characterized by a series of key events that laid the foundations for the further development of Serbia as a sovereign state. Below, we will provide a brief overview of the significant events that marked Serbia in the first part of the 19th century.

¹ Pavlović, S., 2001. *Istorija Balkana 1804-1945*. KLIIO. Belgrade. p. 31.

The beginning of the 19th century found the Balkan Peninsula under the rule of the Ottoman Empire, and Serbia within the framework of a province with limited autonomy². However, under the influence of turmoil in European societies, ideas of national liberation and autonomy began to simmer among the Serbian population. The First Serbian Uprising, which broke out in 1804, represented a strong expression of dissatisfaction with Ottoman rule³. Led by the leader Karađorđe Petrović, the Serbs showed courage and determination in their fight against the Ottomans. This uprising resulted in a short-lived autonomous status for Serbia and highlighted the need for long-term solutions⁴. After a temporary peace, political unrest continued, leading to the Second Serbian Uprising in 1815⁵. This uprising was led and organized by Miloš Obrenović, and had a significant impact on the eventual establishment of autonomy. Miloš's election as the leader of Serbia laid the foundations for the establishment of the modern Serbian state⁶. This was followed by the establishment of the Obrenović, and later the Karađorđević, on the throne, and the consolidation of autonomy under the leadership of Prince Miloš. This phase was characterized by attempts to stabilize society, establish institutions, and seek recognition of autonomy by European powers. Serbia faced challenges and changes during this period, transforming itself from a province into an autonomous state. These events represent a key point in the history of Serbia, laying the foundations for the further development and shaping of the state identity. All these changes had a significant impact on the diplomatic relations of the newly created organization. The importance of these events is reflected not only in the local context but also in the broader European framework, where aspirations for national liberation were an integral part of the political dynamics of the 19th century.

2.2. Liberation from the Ottoman Empire and the establishment of autonomy

The liberation from the Ottoman Empire and the establishment of autonomy in the period from 1815 to 1830 represent key moments in the history of Serbia⁷. These events are the result of profound social, political and cultural changes that had previously marked the territory of present-day Serbia. The liberation of Serbia from the Ottoman Empire became inevitable after a series of conflicts and injustices that the Serbian population suffered under Ottoman rule. The First Serbian Uprising, launched in 1804, was an expression of dissatisfaction and the fight for freedom⁸. Led by the brave Karađorđe Petrović, the uprising symbolized courage and determination in the fight against foreign occupation. However, the temporary agreement between Karađorđe and the Ottoman Empire did not bring a permanent solution, but only postponed the inevitable conflict. As we mentioned earlier in the paper, the Second Serbian Uprising, which broke out in 1815, represented a turning point in the struggle for autonomy. Led by Miloš Obrenović, this uprising led to the formation of an autonomous Serbian principality under the sovereignty of the Ottoman Empire⁹. The key moment was the return of Russia as a great power after its great victory over Napoleon. Miloš Obrenović, one of the dukes and the First Serbian Uprising, used this opportunity to begin the reconstruction of Serbia, but under his absolutist rule and the patronage of the Turks, who were forced to make many concessions due to fear of Russia. Miloš was granted the return of Serbia's status according to the Treaty of Bucharest in 1812.

² Vasić, N., 2016. *Diplomatija i kultura Srbije*. in: *Zbornik radova sa naučnog skupa diplomatija i kultura Srbije: stanje i perspektive*. Institut za međunarodnu politiku i privredu Belgrade. p. 239.

³ Miladinović, B., 2019. *Srpska državotvorna misao u prvoj polovini devetnaestog veka*. Fakultet bezbednosti Univerziteta u Beogradu, Belgrade. p. 7.

⁴ Ibid.

⁵ Đorđević, D., 2017. *Istorija moderne Srbije od 1800. do 1918. godine*. Belgrade. p. 78.

⁶ Ibid.

⁷ Миладиновић, Б., 2019. op.cit. p. 7.

⁸ Sekendek, B., 1999. *Prvi srpski ustanak u Podrinju*. Dom Kulture „Vera Blagojević. Šabac. p 70.

⁹ Đorđević, D., 2017. op.cit. p. 78.

The establishment of Serbian autonomy was a complex process. Miloš Obrenović, as the first prince of modern Serbia, faced challenges in shaping political institutions, stabilizing society, and seeking international recognition¹⁰. An important moment was the beginning of negotiations with European powers and neighboring states, through which Serbia sought to secure its position in the international arena. These events had long-term consequences for Serbia. The establishment of autonomy not only marked the end of Ottoman domination but also laid the foundations for further state development. Serbia became an active participant in European politics, seeking a balance between its interests and the pressures of the great powers¹¹. Liberation from the Ottoman Empire and the establishment of autonomy in the period from 1815 to 1830 are key moments in the history of Serbia. These events not only marked the end of the Ottoman Empire's rule in this region, but also laid the foundations for the formation of the modern Serbian state and its position in the international context.

3. ANALYSIS OF THE POLITICAL SITUATION IN SERBIA 1815-1830

During the period from 1815 to 1830, the political situation in Serbia underwent significant changes and challenges due to the liberation from the Ottoman Empire and the establishment of autonomy. This period was marked by the formation of political institutions, the key roles of leaders, the army and the people in political terms, which will be analyzed through the prism of the social dynamics of that time.

3.1. Overview of political institutions in Serbia during the period 1815-1830

The rise of autonomy led to the need to organize political institutions that would ensure stability and efficient governance of the country. The first step in this direction was the establishment of the Principality of Serbia with Miloš Obrenović as the first prince. Although formally under the sovereignty of the Ottoman Empire, Serbia managed to develop its own institutions of government. By establishing the Council of the Principality, Miloš created a body that advised the ruler in making decisions¹². Also, during this period, other organs of government, such as the judiciary and administration, began to take shape. Political institutions were not only formal structures but also relied significantly on local self-government and customary law. The Assembly, composed of representatives of different regions of Serbia, played a key role in making important decisions and represented a forum for expressing the will of the people, but all this was a facade of Miloš's absolutism¹³.

3.2. The role of leaders, the army and the people in political terms

Leaders played a key role in shaping the political scene. Miloš Obrenović, as the first prince of modern Serbia, was a central figure in leading the country towards autonomy. His diplomatic skills, leadership and organizational skills were essential in achieving political goals. The cult of personality was particularly important in this period in order to create and strengthen unity among the people, and to have a specific person who would translate the path of liberation. The army also played a key role in the political landscape of Serbia. During the uprisings, the army was a key instrument in the fight for freedom and autonomy. However, this is not an army in the modern sense of modern constitutions, as we know it today. Rather, it is about insurgents acting coherently and organizedly. After the establishment of autonomy, the army was necessary to preserve stability and defend against internal and external threats. The role of the people in the political sense was reflected through participation in the Parliament and local authorities.

¹⁰ Perović, L., 2005. *Modernizacija srpskog društva-pokušaji i ograničenja*. Prilozi 34, Sarajevo. p. 309-320.

¹¹ Miladinović, B., 2019, op. cit. p. 7.

¹² Mirković, Z., 2020. *Srpska pravna istorija*. Pravni fakultet Univerziteta u Beogradu. Belgrade. p. 125.

¹³ Marković, R., 2012. *Ustanvo pravo*. Pravni fakultet Univerziteta u Beogradu. Belgrade. p. 114.

This was a period in which awareness of political rights and responsibilities was formed among the population. The political situation in Serbia during the period from 1815 to 1830 was dynamic and characterized by the creation of political institutions, the key roles of leaders, the army and the people. This period sets the foundations for the further political development of Serbia, emphasizing the importance of autonomy, the organization of power and the participation of citizens in the political process.

4. THE DEVELOPMENT OF SERBIA'S DIPLOMATIC RELATIONS WITH NEIGHBORHOOD COUNTRIES

Serbia's diplomatic relations with neighboring countries during the period from 1815 to 1830 represent a key aspect in understanding the country's international position after liberation from the Ottoman Empire and the establishment of autonomy. This segment of the paper analyzes Serbia's diplomatic relations with the Ottoman Empire, the Austrian Empire, and Russia, as well as the influence of European powers on these dynamics.

4.1. Relations with the Ottoman Empire

After liberation from the Ottoman Empire, Serbia maintained diplomatic relations with its former masters. Although formally under the sovereignty of the Ottoman Empire, Serbia became an autonomous principality with a certain degree of internal independence. Diplomatic relations with the Ottoman Empire were shaped by issues of borders, tax arrangements, and recognition of autonomy¹⁴. Negotiations were often complex, given the remaining formal relationship with Istanbul and Serbia's aspirations to strengthen its own state independence. Serbia's diplomatic relations with the Ottoman Empire during the period from 1815 to 1830 represent a complex saga of the search for autonomy, border negotiations, and the preservation of sovereignty, bearing within itself the dynamics of the relationship between the former vassal entity and the central Ottoman authorities. First, Serbia's liberation from Ottoman domination during the First Serbian Uprising of 1804 did not lead to a complete break in relations with the Ottoman Empire. Negotiations between Serbian leaders and the Porte resulted in a temporary recognition of autonomy, which created the basic conditions for preserving peace. Nevertheless, in the following decades, diplomatic relations with the Ottoman Empire were governed by constant tensions¹⁵. Borders were a key issue in relations with the Ottoman Empire¹⁶. Negotiations on territorial issues were often held, and the results varied depending on the political situation and the strength of the Serbian position. Through various agreements and decrees, attempts were made to define the territorial borders between Serbia and the Ottoman Empire, often with opposing interpretations by both sides. The role of leaders, primarily Miloš Obrenović, was crucial in diplomatic relations. Especially after the agreement with Marshli Ali Pasha, he gained the practical position of the master of Serbia under Turkish patronage and the main organizer of tax collection for the Turks, which would bring him great wealth. Miloš demonstrated diplomatic skill in negotiating with the Porte, directing relations towards preserving autonomy and strengthening internal stability. His ability to balance interests within Serbia with external pressures from the Ottoman Empire was crucial for maintaining relations with the Porte. Serbia also faced challenges within Ottoman society.

¹⁴ Popov, Č., 2011. *Međunarodni položaj, spoljna politika i diplomatija Srbije 1804-1878 godine*. Dva veka moderne srpske diplomatije. Balkanološki institut srpske akademije nauka i umetnosti, Institut za evropske studije. Belgrade.

¹⁵ Mirković, Z., 2020. op. cit. p. 125.

¹⁶ Pržić, I., 1993. *Spoljašnja politika Srbije*. NIP Politika. Belgrade. p. 129

The reforms implemented by the Ottoman authorities often had a direct impact on the Serbs, especially in the area of taxes and military conscription¹⁷. In order to secure his position and ingratiate himself with the Turks, Miloš killed many of the great military leaders of the First Serbian Uprising, above all the leaders Karađorđe, Petar Nikolajević Moler, Pavle Cukić and others whom he feared. We believe that in this way he created a bloody throne for himself and the future Obrenovići, as history will show. The issue of recognition of Serbian institutions and autonomy within the framework of these reforms was central to diplomatic relations. In the international context, relations with the Ottoman Empire were not isolated. The influence of the great European powers, such as Russia and Austria, played a significant role in shaping these relations. The presence of the great powers, with opposing interests in the region, often further complicated negotiations between Serbia and the Ottoman Empire. Serbia's relations with the Ottoman Empire during the period from 1815 to 1830 were marked by a search for a balance between autonomy and the preservation of relations with the Porte. Issues of borders, internal reforms, and the influence of European powers formed the core of these diplomatic relations, often making them complex and tense. These relations laid the foundations for Serbia's further international relations and marked steps towards complete separation from the Ottoman Empire.

4.2. Relations with the Austrian Empire and Russia

The Austrian and Russian Empires were key players in Serbia's diplomatic landscape during this period. Austria was interested in preserving the balance of power in the Balkans and preventing Russian hegemony. On the other hand, Russia was an ally of the Serbs in their quest for autonomy, having similar interests in reducing the influence of the Ottoman Empire. Diplomatic relations with Austria and Russia were often reflected in political decisions in Serbia. Issues of territorial arrangements, trade agreements, and support in international forums were key in these relations. Russian assistance in diplomatic recognition of autonomy was particularly important for Serbia¹⁸. Russian support was crucial in achieving Serbia's autonomy. During the First and Second Serbian Uprisings, Russia provided moral, political, and military support to the Serbian insurgents. This was crucial in overcoming the strong resistance of the Ottoman Empire and creating the conditions for the formal recognition of Serbian autonomy¹⁹. However, Miloš, like the later Obrenovići, did not show gratitude to Russia, but was more oriented towards Austria and its allies. Diplomatic relations with Russia enabled Serbian leaders, above all Miloš Obrenović, to build alliances that had far-reaching consequences. Russia, as one of the great powers, gave Serbia political weight that was essential in international negotiations and the recognition of Serbian autonomy by other European powers²⁰. Religious ties between Serbia and Russia further strengthened their alliance. Both countries belonged to the Orthodox world, which created an additional sense of connection and mutual interest. The Russian Tsar, as well as the Serbian rulers, often emphasized religious connection and Orthodox brotherhood, which further strengthened their diplomatic cooperation. Russia also played a role in the international recognition of Serbia. Its political and diplomatic support was crucial in convincing other European powers to recognize the autonomy of the Serbian principality. Russian influence played a significant role in decision-making processes on the international stage, creating a positive climate for the recognition of the new statehood.

¹⁷ Mirković, Z., 2020. op. cit. p. 125.

¹⁸ Ibid.

¹⁹ Perović, L., 2016. Srpsko–ruske istorijske analogije. in: *Potka srpskog identiteta. antizapadnjaštvo, rusofilstvo, tradicionalizam*. p. 55-77.

²⁰ Pržić, I., 1993. op. cit. p. 129.

Relations with Russia during this period were not only diplomatic, but also had a significant impact on the political and social development of Serbia. Russian support was essential in shaping the awareness of independence and identity of the Serbian people.

4.3. Influence of European powers on diplomatic relations in Serbia

The influence of European powers, especially Great Britain, France and Prussia, was evident in the formation of diplomatic relations in Serbia. The European powers were interested in preserving the balance of power in the Balkans and preventing the spread of Russian influence. Serbia's diplomatic relations were often influenced by European political dynamics, and international pressure often played a role in shaping the country's domestic politics.

4.4. International recognition of autonomy

The international recognition of Serbia's autonomy during the period from 1815 to 1830 represents a key phase in the formation of the modern Serbian state. The first step towards autonomy was the First Serbian Uprising, launched in 1804 under the leadership of Karađorđe Petrović. The uprising was a response to decades of injustice and oppression by the Ottoman Empire. During this period, Serbia managed to create temporary autonomy, but the peace between Karađorđe and the Ottoman Empire in 1813 led to a temporary setback in the pursuit of lasting political goals²¹. The Second Serbian Uprising, led by Miloš Obrenović, was crucial in creating the conditions for international recognition of autonomy. Miloš's diplomatic skills contributed to a significant improvement in relations between Serbia and the Ottoman Empire. The uprising culminated in the Treaty of Bucharest in 1812, which confirmed Serbia's autonomy under Ottoman sovereignty²². Serbia intensified diplomatic efforts to secure international recognition of its autonomy. Key diplomats, such as Jevrem Miljković and others, were engaged in negotiations with European powers to gain support for Serbian causes. Russia was instrumental in Serbia's diplomatic efforts towards international recognition. Tsar Alexander I of Russia supported the Serbian insurgents during the First Serbian Uprising, and after the Treaty of Bucharest in 1812, Russia was among the first to recognize Serbia's autonomy. This support was instrumental in persuading other European powers to follow Russia's example²³.

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²¹ Marković, R., 2012. *Ustanvo pravo*. Pravni fakultet Univerziteta u Beogradu. Belgrade. p. 128.

²² Popović, R. J., 2016. *Bukureški mir, knez Miloš i autonomija Srbije*. Belgrade. p. 111-128.

²³ Kutlešić, M., 2011. Preokret u politici lorda Palmerstona prema Rusiji i Osmanskom carstvu (1827–1833). in: *Istorijski časopis* no. 60. p. 311-331.

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4.7. Cultural and economic diplomacy

Cultural diplomacy in Serbia during this period aimed at one of the most important functions – building and strengthening the international reputation and presentation of Serbia's cultural heritage. Leaders such as Prince Miloš Obrenović were aware of the importance of culture in shaping international opinion. The first step in this direction was to raise awareness of the Serbian language and cultural heritage. Educational programs were focused on teaching the Serbian language, history and folklore. Schools and colleges became places where not only knowledge was transmitted, but also the spirit of Serbian culture was spread. In addition to educational institutions, cultural diplomacy also included cultural events, exhibitions, theaters and other forms of artistic expression. This was a means by which Serbia presented itself to the world, creating a positive image of the country and its cultural wealth. On the international level, Serbia sought to build partnerships with other cultural centers in Europe. Cooperation with writers, artists, and educational institutions from surrounding countries contributed to the spread of the influence of Serbian culture. Serbia's economic diplomacy during this period was also of key importance in ensuring the stability and prosperity of the country. Creating economic ties and partnerships with other countries aimed to attract investment and increase economic production. Serbia implemented various economic strategies, including signing trade agreements and directing various sectors of the economy towards development. Infrastructure projects and encouraging agriculture were in focus, with cooperation with other countries playing a key role. Serbia's foreign trade activity was a subject of particular interest. Achieving a balance between exports and imports was critical for economic stability. Negotiations and agreements with neighboring and distant countries helped open new markets and expand opportunities for the exchange of goods and services.

5. DIPLOMATIC CHALLENGES AND PROBLEMS OF SERBIA IN THE PERIOD FROM 1815 TO 1830

The diplomatic challenges and problems that shaped the period from 1815 to 1830 in Serbia were diverse, encompassing internal disagreements as well as external pressures aimed at preserving the country's autonomy. Serbia was faced with internal divisions between supporters of the Obrenović dynasty and supporters of the Karadžević dynasty.

These dynastic struggles created political instability and made it difficult to make coherent diplomatic decisions. The issue of the legitimacy of power was crucial in relations within the country, hindering a unified approach to external issues. Competition between different political leaders, including military leaders, created rivalries that often produced contradictions in diplomatic negotiations. The issue of power and influence was often a priority in relations within Serbia, given the uneven views on the direction in which the country should develop. Serbia, during this period, created and developed its own political institutions. However, these institutions were often ineffective and subject to internal strife. The lack of a solid institutional foundation made it difficult to conduct consistent diplomacy. Although Serbia formally enjoyed autonomy, relations with the Ottoman Empire were a constant issue. The Porte's pressure to maintain formal sovereignty created diplomatic challenges. Issues such as borders, taxes, and military obligations were often the cause of disagreements. Great European powers, such as Russia and Austria, also exerted pressure on Serbia. Rivalries between these powers, along with interests in the Balkans, created additional complexity in Serbia's diplomatic relations. Between the desire to preserve autonomy and the need not to offend any of the great powers, Serbian leaders had to carefully balance. Neighboring countries, such as Austria and the Ottoman Empire, had their own interests in the Balkans. Border issues and territorial disputes were frequent, creating conflicts that further complicated Serbia's diplomatic relations. Diplomatic challenges and problems in Serbia from 1815 to 1830 were the result of internal divisions and external pressures. Within the country, political rivalries and institutional instability hindered a unified approach to diplomacy.

6. CONCLUSION

Researching Serbia's diplomatic relations in the period from 1815 to 1830, we could conclude that the initial hypothesis is confirmed. During this period, Serbia's diplomatic relations were shaped by complex factors, including political, cultural, and economic aspects, stemming from the liberation from the Ottoman Empire and the establishment of autonomy. The liberation from the Ottoman Empire and the establishment of autonomy created challenges in Serbia's diplomatic relations. Within the country, the struggles between the dynasties (Obrenović and Karadorđević) contributed to the complexity of the political landscape. Also, relations with the Ottoman Empire required careful management in order to preserve autonomy, but also to avoid serious conflict. Through cultural diplomacy, Serbia built its identity and presented itself to the world. Language, history, and folkloric heritage became the means by which Serbia communicated its culture to the international community. This contributed to creating a positive image of the country and support for its diplomatic efforts. In economic terms, Serbia was active in building international economic ties and trade relations. Developing infrastructure, encouraging agriculture, and signing trade agreements were key elements of economic diplomacy. These efforts contributed to strengthening the country's economic stability. We can confirm the initial hypothesis that Serbia's diplomatic relations in the period from 1815 to 1830 were indeed shaped by complex political, cultural, and economic factors. Liberation from the Ottoman Empire and the creation of an autonomous Serbian state represented a challenging period that required thoughtful diplomatic action. Political struggles, cultural representations, and economic initiative formed the basis for building Serbia's international reputation and preserving autonomy. The diversity of challenges that Serbia faced during this period testifies to the complexity of diplomatic relations and the need to adapt to changing circumstances. A comparison can be made with the present time, where the great powers of the West are influencing the territorial disintegration of the Serbian people and the seizure of large Serbian territories, along with the persecution and murder of Serbs. We find ourselves in an unstable world where the option of war looms over the heads of many nations due to the attempts of some great powers from the end of the 20th century to maintain dominance.

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INTERNATIONAL DISPUTES AND THEIR PEACEFUL RESOLUTION

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ABSTRACT

The author defines an international dispute as a serious disagreement between two or more subjects of international law, i.e. international relations regarding some fact or right i. e. opposing their subjective rights, interests, attitudes and arguments. Since the states are the basic and most important subjects of international law and international relations, the most important international disputes arise primarily between them. The paper explains the differences between an international dispute, situation, incident, crisis and conflict. After reminding that international disputes are usually divided into legal and political, but that there are also disputes which are somewhere in between, a definition of peaceful settlement of disputes is given, and then the most important types of means for resolving disputes are presented: 1) legal or judicial; 2) diplomatic or political and 3) legal-political ways of resolving disputes. In respect of each of the mentioned mechanisms, a review of its good and weak sides is given, together with its comparison with similar means. The author concludes that due to the scope, complexity and diversity of international relations, it is necessary to have numerous and developed means for the peaceful settlement of international disputes, but that all of them sometimes fail. A special problem is the fact that certain states violate the obligation to peacefully resolve international disputes, with the fact that, especially if it comes to really powerful countries, this sometimes remains without an adequate response from the international community.

Keywords: *International Disputes, International Law, Peaceful Settlement*

1. INTRODUCTION

Before moving on to ways of peaceful settlement of international disputes, it is necessary to explain what an international dispute is and how it differs from some similar phenomena.

1.1. International dispute

In the narrow, usual meaning, the one given from the point of view of international law, an international dispute is a serious disagreement between two or more subjects of international law, i.e., international relations regarding some fact or right, i.e., opposition of their subjective rights, different interests, attitudes, and arguments. From the fact that states are the basic and most important subjects of international law and international relations, on which everything that happens in the international community ultimately depends, it follows that international disputes arise primarily between states. In order for an international dispute to exist, it be necessary that there is a sufficiently serious disagreement between the states regarding some important moment that spoils their mutual relations. A simple disagreement of views is not in itself a dispute. Also, an important element of the dispute is that it is not about some kind of "traditional" intolerance, about general bad relations and the like, but about a disagreement over a specific issue. Sometimes disputes refer to phenomena that are more precisely called situations, incidents, crises or conflicts. These are not disputes in the narrow sense of that term, but they also imply the necessity of their peaceful resolution, which means that for their resolution, in principle, means for the peaceful resolution of international disputes are used.

1.2. Situation

In practice, it happens that there are several disputes between given states that are long-lasting, particularly complex and interconnected. Then it is usually not about an international dispute, but about a so-called situation. The UN Charter (Art. 34, 35/1, 36/1) distinguishes between disputes and situations, although it does not provide criteria for their distinction.

An example of a situation that has been lasting for several decades is relations between North and South Korea. The way to overcome the situation is to insist on its solution exclusively by peaceful means and to solve the easiest issues first, so that, relying on the achieved results and the growth of mutual trust, we move on to more complex and sensitive problems.

1.3. An International incident

It is the name for a certain unpleasant event, undesirable case, small conflict, and the like that is of such a nature, significance, and intensity that it threatens or spoils relations between states or causes other harmful consequences. It can be something caused by human beings, in which case it is an incident in the narrower sense. In a broader sense, international incidents also mean accidents that occurred independently of human will, by accident or by force majeure, and affected the important interests of other countries (eg an accident in a nuclear power plant that spread beyond the borders of the respective country). Considering the type of international relations concerned and the consequences caused, incidents are usually divided into armed incidents, border incidents, diplomatic incidents, etc. Unlike a dispute, which boils down to a disagreement about something or conflict of opinions and interests, an incident is a certain event i.e. an action including its immediate consequences (violation of foreign airspace, arrest of a foreign diplomat, etc.). Despite this difference in principle, in practice, incidents and disputes are usually closely related, with the fact that the incident often leads to an international dispute. One of the latest international incidents is the destruction on 26 September 2022 of the gas pipelines Nord Stream 1 and Nord Stream 2 by three sizeable explosions. So far, we only know for sure that it is a matter of sabotage, with the governments of Russia and the USA accusing each other of it.

1.4. International crises

In the narrow sense that we have in mind here, an international crisis is called a tightening of relations, especially a serious dispute and confrontation between two or more states in connection with some concrete problem of political, military, economic or similar nature. Because it usually stems from an unresolved dispute, an international crisis could also be described as an international dispute that has gotten out of hand or threatens to get out of hand. However, a crisis can also occur without any previous dispute. Like an international dispute, it is best to resolve a crisis as soon as possible, with the fact that, according to modern international law, this can only be done by peaceful means. Many international crises have been resolved by peaceful means, but some of them have turned into armed conflict. Some of the most famous contemporary international crises are: the Cuban Missile Crisis (1962), Iran Hostage Crisis (1979-1981), Yugoslavian Crisis (1989-2002), Syrian Crisis (since 2011), Ukrainian Crisis (since 2014), etc.

1.5. International conflict

This term has various meanings, among which is unarmed conflict, a kind of harsh but peaceful confrontation between interested states. We have in mind exactly that meaning here. The most common cause of conflict is an unresolved dispute, especially one that affects important state interests. This means that it is then necessary to identify that dispute and approach its resolution by peaceful means, which, if that process ends successfully, will, in most cases, lead to the resolution of the conflict itself. A typical example of an international conflict has been the conflict between Russia and Ukraine lasting from 2022, in which various ways and several others, primarily Western countries participate as well.

1.6. Relativity of division

The above division into international disputes, situations, incidents, crises, and conflicts must be understood conditionally. First of all, these are not the only possible classifications.

In international documents and literature of international law, one can find various names for disputed situations in international relations-misunderstanding, inconsistency of views, differences of opinion, serious disagreement, conflicting demands, opposition, situation, dispute, conflict, etc. Everything is even more complicated due to the fact that none of the mentioned terms has a generally accepted and fully defined meaning. Therefore, it happens that one party perceives and marks the disputed reality in one way (eg as a misunderstanding) and the other calls it, and therefore marks it, differently (eg as a serious dispute).

Although each specific situation is a case in itself, they all have in common that they should be resolved without delay and exclusively by peaceful means. Otherwise, there is a danger that the situation will constantly worsen, so that, for example, what started as a misunderstanding or an incident grows into an international dispute, crisis, or conflict, and then turns into an armed conflict. This gives us the right to view all the mentioned phenomena in a special, broader sense as a kind of international dispute in a broader sense, which, if not resolved in a timely manner in a peaceful way, can get out of control and turn into a war.

2. TYPES OF INTERNATIONAL DISPUTES

Among the various possible classifications, one of the most important is the division of international disputes into legal and political. It is carried out on the basis of two criteria: 1) with regard to the essence of disputes and 2) with regard to the means for their resolution.

2.1. Legal disputes

These are disputes of a legal nature, which means those related to legal facts, interpretation and application of international law, determination of the amount and nature of compensation due to the violation of a right, and the like. For example, it may be disputed whether there is a legal norm or what its content is, whether a certain international agreement has entered into force, whether contractual obligations have been fulfilled, what is the legal status of a certain territory, whether there is a basis for compensation and what should be the amount of that compensation, etc. The basic characteristics of these disputes are as follows: 1) they can only arise between states and other subjects of international law; 2) they are resolved on the basis of international law and in legal proceedings; 3) the decision is made by a legal authority-an international court or arbitration in the form of a verdict; and 4) the decision (verdict) is binding for the parties to the dispute.

2.2. Political disputes

There are also international disputes which do not arise in connection with the interpretation and application of the law but due to the conflict of political, security, economic, and other interests. Such are, e.g., disputes about the different ranks of states, about the name of a state, about the division of spheres of interest, about whether certain forces represent terrorists or freedom fighters, etc. International law is usually taken into account in these disputes as well, but they are not resolved by the application of specific legal norms, but by various political agreements, decisions of political representatives, decisions of international conferences, and the like.

2.3. Mixed disputes

In practice, it is often difficult to draw a clear line between legal and political disputes because the relationships and issues involved have both sides. For example, undoubtedly, there are both legal and political moments in disputes about whether aggression was committed in a given case, in disputes about the delimitation or violation of a state border, in disputes related to the succession of states, etc. After all, even when it seems to be a purely legal dispute, it always has a political dimension. On the other hand, even when it seems to be a classic political dispute, it is almost impossible to avoid its attachment to certain legal arguments, legal principles, legal procedures, and the like.

Many political disputes, which have burdened international relations for a long time, have been permanently resolved through legal instruments. So, for example, the problem of the rank of diplomatic representatives, and thus the order of their priority, which was a source of disputes and conflicts for centuries, was solved with the help of law - the Vienna Regulation on the Precedence of Diplomatic Agents (1815) and, especially, the Vienna Convention on Diplomatic Relations (1961), which created automaticity, by diplomatic representatives are ranked according to the date and time of assuming their duties.

3. PEACEFUL SETTLEMENT OF INTERNATIONAL DISPUTES

Peaceful settlement of international disputes refers to various procedures, measures, and activities that should ensure that disputes and disputed situations are resolved as soon as possible, in a way that is as acceptable as possible for all interested parties and, in any case, without resorting to force. in international relations. Unlike the past, in which states were free to resort to force when they considered it justified and useful, the UN Charter and all current international law prohibit not only the use of force, but also the threat of force in international relations. At the same time, they insist not only on the exclusively peaceful settlement of international disputes, but also on the obligation of peaceful settlement of those disputes. It is the duty of the states not to allow the dispute to develop into a serious friction and conflict, by proceeding to its resolution without delay. This obligation is established by the UN Charter (Art. 2/3, 33/1, 37/1), a series of universal and regional international legal documents,¹ as well as a large number of bilateral international agreements. It is enough to remind us only of Art. 2/3 of the UN Charter, which specifies: "All Members shall settle their international disputes by peaceful means in such a manner that international peace and security, and justice are not endangered." In addition, the obligation to settle international disputes peacefully has become a rule of universal international customary law, which means that it applies to all states, even those that are not members of the UN or a treaty that expressly prescribes this obligation.²

4. MEANS FOR THE PEACEFUL SETTLEMENT OF INTERNATIONAL DISPUTES

Considering the nature of the body involved in dispute resolution, the form of the procedure, the criteria and sources on the basis of which the dispute is resolved, and the degree of bindingness of the respective body's decision, it is common to divide peaceful means of dispute resolution into legal (judicial) and political (diplomatic). We believe that in our time it is more correct to talk about: 1) legal (judicial), 2) diplomatic (political) and 3) legal-political ways of peaceful settlement of international disputes.

4.1. Legal Means

This is about the legal dispute being resolved by the competent international legal authority in legal proceedings and applying the rules of international law. The objective of this mechanism is to resolve the dispute in accordance with applicable international law and, as far as possible, in accordance with justice.

¹ On the universal level: Revised General Act on the Peaceful Settlement of International Disputes (1949), UN Declaration on Principles of International Law on Friendly Relations and Cooperation of States in Accordance with the Charter of the United Nations (1970), GA Resolution on Peaceful Settlement of Disputes Between States (1982), Declaration on the Prevention and Removal of Disputes and Situations Which May Threaten International Peace and Security and on the Role of the United Nations in this Field (1988), etc. The obligation to settle disputes peacefully is also incorporated into many important treaties, such as Art. VIII of the Convention on the Privileges and Immunities of the United Nations (1946), Art. 9 of the Convention on the Prevention and Punishment of the Crime of Genocide (1948), Art. 38 of the Convention on the Legal Status of Refugees (1951), Art. 279 of the UN Convention on the Law of the Sea (1982), etc. In regional frameworks, it is stipulated by the American Treaty on Pacific Settlement (1948), European Convention for the Pacific Settlement of Disputes (1957), Art. 1. of the North Atlantic Treaty (1949), etc.

² This was confirmed by the International Court of Justice in the *Case Concerning Military and Paramilitary Activities in and Against Nicaragua*, 1986, para. 290, 135.

The legal method of resolving international disputes has the following features: 1) it is suitable only for the resolution of legal disputes; 2) such disputes are resolved by legal bodies - international courts and arbitrations; 3) it is conducted in a public and strictly formal legal procedure; 4) it is based on the presented requests and presented evidence; 5) the decision is made on the basis of and with reference to the rules of international law; 6) the decision is international court or arbitration verdict, which is binding on the parties to the dispute.

This method has a number of advantages, such as formality, precision, certainty regarding the procedure and decision-making mechanism, the obligation of the final decision, contribution to the strengthening of the international legal order, etc. Its weaknesses are that it cannot be used to resolve political disputes; that the court or arbitration proceedings can only be initiated based on the agreement of the parties to the dispute, and it is not always possible to achieve it; that such a procedure is public (which does not always correspond to the interests of the parties to the dispute); that the process often ends with declaring one party responsible and determining its obligation to pay compensation, which makes that party feel the loser, and therefore dissatisfied; that such a procedure can take too long and be too expensive. etc.

4.2. Diplomatic (political) means

These are the ways of solving international disputes, which take place through political representatives of states, especially through so-called diplomatic channels. Their goal is not to satisfy the requirements of international law at all costs, or even the requirements of justice, or fairness, rather, efforts are made to end the dispute as quickly as possible and the relations between the parties to the dispute return to normal. These means usually involve the participation of diplomatic authorities, although they can also mean the involvement of other authorities and bodies, and even individuals. Essentially, if they fail alone to come to an agreement, the disputing parties turn to some external authority, inviting him to help establish contact between them, establish disputed facts or find a solution. These means include direct negotiations, inquiry, good offices, mediation, and conciliation.

4.2.1. Direct negotiations. - This method boils down to direct contact of representatives of interested parties, the exchange of their opinions and proposals, with the aim of finding a solution acceptable to both parties. If the negotiations fail, this does not release the parties from their obligation to continue to seek a peaceful solution to their dispute through some other mechanism. Direct negotiations are the most natural, fastest, and cheapest way to resolve a dispute. Negotiations have many other advantages: they can be used alongside other means of peaceful dispute resolution; they can be used in all types of disputes; they are completely in the hands of the parties to the dispute; since there are no third parties, the negotiators can be completely open in expressing their views and motives; each party can cancel negotiations at any stage; etc. Other advantages of negotiations are that they can take place independently, but also in parallel with other ways of peaceful settlement of disputes; that they can easily be continued when they are interrupted; that in case of success, they contribute to better mutual understanding and strengthening of mutual trust; that the fact that the solution was reached by agreement in principle in itself guarantees that the solution will be respected (*Handbook on the Peaceful Settlement of Disputes between States* 1992, 9-24; Merrills 2005, 1-27; Druckman 2007, 25-60; Tanaka 2018, 29-42). The weaknesses of direct negotiations are that they are conducted between parties who, by the nature of things, are distrustful of each other, so instead of seeking a compromise, negotiators are often inclined to lead polemics and defend the views of the party they represent, which, if not overcome, can doom the negotiations to failure because they are reduced to conversation of the deaf. However, the advantages offered by direct negotiations are such that this method of dispute resolution is irreplaceable even in our time.

Even today only a small part of disputes reach international courts, while the most difficult problems in the majority of cases are resolved through negotiations due to their advantages, such as flexibility and confidentiality.

4.2.2. Inquiry. - This is the way of peaceful settlement of international disputes, which consists in the formation of investigative bodies (commissions of inquiry, expert groups, etc.) for the purpose of investigation and true determination of the facts that led to the specific dispute or are important for its resolution.

Practice shows that disputes often arise because the respective parties have different views on the essential elements of an event - whether something happened, where it happened, who were the actors in the event, etc. The parties to the dispute may agree on how the relevant issues are regulated by international law, but if their perceptions of the factual situation differ significantly, a dispute arises that cannot be resolved by the simple application of the law.

The inquiry can have a dual role. It can be part of the dispute resolution process, one of the previous stages before the resolution of the dispute by certain means of peaceful dispute resolution. However, in some cases, the inquiry itself can lead to the end of the dispute, which will especially be the case when it is determined that there is a delusion, a wrong idea of reality on the part of one or both parties. The inquiry is usually entrusted to a collective body, composed of 3 or 5 members from different countries. With the agreement on the establishment of the commission of inquiry, the parties to the dispute specify the facts to be investigated, the composition of the commission, the legal status and authorization of its members, the deadline for the commission to submit a report, and other issues if necessary. For the sake of finding out the exact and precise situation, the commission usually has the right to conduct an on-site investigation, collect information and data, hear witnesses, carry out measurements, tests, analyses, etc., but all this only with the consent of the territorial state and, as a rule, in the presence of its representatives. After finishing its inquiry, the commission submits a report in which it announces the findings it has reached.

The advantages of the inquiry are its flexibility and the possibility to consider various issues by a body whose members are not politicians but experts, which should guarantee the need for a degree of objectivity. In practice, the inquiry is particularly often used in respect of border incidents, plane crashes, ship sinkings, disputes related to major environmental pollution, and the like. In such a case, the investigation is usually only one phase of the dispute resolution process, in the sense that after the facts are determined, the dispute is usually definitively resolved in direct negotiations or in some other way. There are many reasons for this, among which it should be mentioned that the dispute is rarely reduced to just a dispute about the facts; that experts have neither political insight into relations between states, nor legal and other broader knowledge, necessary for a definitive settlement of the dispute; etc. It should be added that the inquiry is not suitable for cases in which disputed are not facts, but something else (e.g., in the case of a disagreement over a interpretation of an international treaty), dispute encroaches on the important national interests of states, etc.

Although the work of the commission of inquiry may resemble international arbitration, the differences are essential. While arbitral judges are almost always lawyers, the members of the investigative commission are appointed from the ranks of experts of the appropriate profession, depending on which facts need to be established; while the arbitration determines the factual situation in order to apply international law, the investigative commission is satisfied only with establishing the facts; while the arbitration verdict binds the parties to the dispute, the parties to the dispute have full freedom in terms of what they will do in relation to the commission's report.

4.2.3. Good services and mediation

Good services consist of the fact that a third party, an impartial entity accepted by both parties in the dispute, tries to bring them into contact, so that they can reach a satisfactory solution between themselves. As soon as he succeeds in ensuring immediate communication between the parties to the dispute, the good service provider has completed his mission. The role of the one who performs good services can be various entities—a third country, several third countries, an international organization, and even a prominent person (eg the head of a third country). Nowadays, along with the strengthening of the role of international organizations, the importance of good services performed by the highest officials of those organizations, especially the Secretary General of the UN, is increasing (*Handbook on the Peaceful Settlement of Disputes Between States* 1992, 33-40; Tanaka 2018, 43-45).

The purpose of good services is to induce parties whose mutual relations are, for some reason, rather bad to establish direct contact, with the idea that diplomatic negotiations or some other way of peacefully resolving the dispute will follow. For this goal, the performer of good services tries to please the parties in the dispute, conveys messages between them, persuades them to enter into negotiations, points out the harmful consequences resulting from the existence of the dispute and the like. However, he does not participate in the resolution of the dispute itself - it remains entirely in the hands of the parties to the dispute. In this way, the basic elements of good services are: 1) the participation of a third, impartial party; 2) the third party can offer himself or be invited, but must certainly be accepted by both parties; 3) the third party tries to bring the parties in the dispute closer together, but does not take part in the settlement of the dispute itself—does not present its proposals, do not make decisions and the like; 4) good services are usually performed discreetly, without publicity; 5) in case of success, the result is reflected in the rapprochement of the parties in dispute. The dispute itself is not resolved this way, but only the assumptions are created to continue the search for a solution by other means.

On the other hand, mediation is a means in which an entity that is not involved in the dispute (mediator, third party) takes active steps (giving proposals, advice, suggestions, objections; persuasion; conveying requests or answers to the other party; managing negotiations, etc.) in order to achieve an amicable solution, to bring the parties to the dispute closer together and enable the initiation and successful flow of direct negotiations between them, i.e., reaching a final agreement on the settlement of the dispute. The mediator does not resolve the dispute, nor can he impose his will. His role is to help the respective parties in the dispute resolve it themselves with advice, suggestions, remarks, and the like. A third country, an international organization, a collective body (commission) or a reputable individual can be found in the role of mediator. In some cases, special international conferences were convened for the purpose of mediation (Salman 2003, 155-200; Bercovitch 2011; Greig, Diehl 2012; Кривокапич Б. 2020, 249-266).

The basic elements of mediation are: 1) participation of a third, impartial party (mediator); 2) the third party may offer himself or may be invited, but must be accepted by both parties in the dispute; 3) the mediator tries to help the solution with his proposals, advice, and the like, but it is still exclusively in the hands of the parties to the dispute; 4) the mediator's advice is not legally binding; 5) mediation occurs in various forms at various stages of dispute resolution; 6) mediation can exist independently or in parallel with other dispute resolution mechanisms. Although it has similarities with good services, mediation differs from them in that the participation of the third party is much more pronounced, active and creative, with the right of the mediator to present his suggestions, advice, recommendations, and comments. Yet, in modern practice the difference between mediation and good services has mostly disappeared, because good services have been absorbed into mediation in the sense that the third party, as a rule, plays an active role from the very beginning, trying not only to bring the parties in dispute closer together, but and to help find an acceptable solution as quickly as possible.

4.2.4. Conciliation

As a way of peaceful settlement of international disputes, conciliation consists in the consensual delegation of the dispute to a chosen third party (commission, possibly an individual) who is authorized to comprehensively examine the matter from both the factual and legal sides, and based on that knowledge, acting objectively and unbiased, propose a ready-made solution (Jackson 1958, 508-543; Merrills 2005, 64-90; Laidlaw, Phan 2019, 126-159). The conciliator is authorized to gather information from the parties to the dispute in order to conduct an investigation in order to establish the factual situation, and to engage in legal issues. His work ends with a report in which he formulates a definitive solution that he offers to the parties to the dispute. It has the character of a recommendation and does not bind the parties to the dispute. The conciliation commission (in practice, the role of conciliator is most often entrusted to a collective body) can be formed for a given case, but it can also be contracted in advance. In a way, the conciliator is a special type of mediator, whose characteristics are: 1) he never offers himself, but must be invited; 2) his role is far more active than that of an ordinary mediator; 3) in principle, he does not offer various temporary or small suggestions and advice, but rather comes before the parties in the dispute with a ready-made solution; and 4) his mandate is usually time-limited – he receives a set deadline (usually 6 months) in which he should come up with his final proposal. The advantages of conciliation are that the conciliator gives a ready-made solution with the fact that it is valid only if both parties accept it, so that no one feels defeated or hurt, but the impression is created that it is a joint solution, a true reconciliation. This method of peaceful settlement of disputes has certain similarities with inquiry, arbitration, and mediation. When necessary, the conciliator conducts an inquiry, just as the commission of inquiry does, yet he does not stop there but also deals with legal issues, so that his final report is not just his finding, but a proposal, based on all his knowledge and analysis. Because the conciliator is an independent body that proposes a solution to the dispute, this mechanism is somewhat similar to arbitration, but the differences are notable – conciliation can be used to resolve not just legal, but all disputes; the decision of the conciliator is not legally binding for the parties to the dispute, etc. Finally although conciliation is somewhat similar to mediation because in both cases the dispute is considered by a neutral body whose proposal is not legally binding, the difference is that the conciliator cannot offer such a service on his own; that unlike the mediator, whose mandate is usually not time-limited, the conciliator has a set deadline (usually 6 months) in which he should come out with his final proposal; as in the fact that mediator can submit a series of consecutive and even alternative proposals while the conciliator, after familiarizing himself with the dispute, submits a report offering a finished solution.

4.2.5. Importance of diplomatic ways of resolving disputes

The main advantages of diplomatic methods of peaceful settlement of disputes are the following: (1) they are confidential, which is often very important for states; (2) there is a whole series of such methods that can be combined and complement each other, which (3) enables the choice of the means that are most suitable for a specific dispute or for a given stage in the resolution of the dispute, whereby it is about (4) flexible methods, adaptable for various types of disputes and various situations, which (5) enables a solution to be found in some kind of compromise, so that no one is a complete winner, but neither is a complete loser, and (6) the dignity of the parties to the dispute remains preserved, because a solution can be reached without declaring anyone guilty or a loser, with the proviso that (7) acceptance of these mechanisms does not mean final consent to the obligation of the solution that will be offered by the other party or a third, independent factor in the further procedure.

The conditional weaknesses of these means are that they depend on the willingness of the parties to the dispute to cooperate, implying the right of each of them to withdraw from negotiations, mediation, etc. that have already started, whenever they decide to do so, and in the fact that, except in the case where their result is reflected in some legally binding agreement between the parties to the dispute, everything ends with acts that have an optional character, such as various proposals, reports, recommendations, and the like.

4.3. Legal-political means

Although it can be thought that the legal (judicial) and political (diplomatic) means of peaceful settlement of international disputes are in a certain sense opposed to each other, in fact it is not so. In practice, they are often combined, especially when some of them are more suitable for one and others for another phase of dispute resolution. For example, the first step towards resolving the dispute can be good services and mediation (diplomatic means) so that when certain progress is made, the final solution of the dispute can be entrusted to an international court or arbitration (legal means). The point is that in such cases, the respective means remain as they are, and what goes beyond the usual framework is combining them by using these means simultaneously (parallel) or successively (one after the other). However, there are also some mixed means, which in themselves are partly legal and partly diplomatic. Therefore, they can be called legal-political means.³ The most important such methods are the settlement of international disputes before UN bodies, before other international organizations, before special international bodies and based on the provisions of international treaties. One of the main organs of the UN is the International Court of Justice, which exists to resolve international legal disputes. Yet, here we are interested only in the role of other UN bodies, primarily the Security Council and the General Assembly. According to the UN Charter (Art. 33/1), if the parties to a dispute fail to resolve it in some other way, they are obliged to bring it before the UN, especially if it is a dispute that threatens to disrupt interstate relations and threaten international peace and security (*Handbook on the Peaceful Settlement of Disputes Between States* 1992, 111-133; Peck 1996; Merrills 2005, 127-180, 237-278; Bercovitch, Jackson 2012, 61-75). There are many other international organizations, both universal and regional, with their own mechanisms for the peaceful settlement of disputes.⁴ Although due to the different profiles, tasks, composition, and powers of these organizations, bodies, solutions differ, there are also many similarities. They are reflected in the facts that the highest act of the international organization stipulates the obligation to settle disputes peacefully, that concrete mechanisms such as direct negotiations, conciliation, mediation, etc. are often mentioned; that before the bodies of these organizations, only those disputes that are within the jurisdiction of the respective organization can be resolved; that in many cases there is option of entrusting the resolution of the dispute to the political body of the respective organization, with the parties to the dispute committing in advance to recognize the decision of that body as legally binding; that special bodies and procedures for the peaceful settlement of disputes between member states are established (eg expert bodies, commissions, panels) etc. (Malinverni 1991, 545-586; *Handbook on the Peaceful Settlement of Disputes Between States* 1992, 81-146; Merrills 2005, 211-307; Tanaka 2018, 275-310). Special mechanisms for the peaceful settlement of disputes have various international bodies that are not international organizations, although they are established by an international treaty and have international legal subjectivity. An example is the International Criminal Court (ICC), which is interesting here for two reasons.

³ They are sometimes classified as diplomatic means, because the resolution of the dispute is not sought in legal proceedings before the competent judicial authority. Such an approach is not justified, because it overlooks the difference between these and diplomatic means in the narrower sense. After all, this is recognized by some international legal documents, which speak about legal, political, but also about mixed disputes. An example is Art. 18 of the European Convention for the Peaceful Settlement of Disputes (1957).

⁴ Some of these organizations have their own courts (e.g. the Court of Justice of the European Union, the Court of the European Free Trade Area, the Central American Court of Justice, the Caribbean Court of Justice, the East African Court of Justice, etc.) but these, however, belong to the legal (judicial) ways of solving international disputes.

By deciding on the guilt and punishment of persons accused of having committed the most serious international crimes, the ICC is in a position to contribute to the individualization of guilt, reconciliation and the like. What is more interesting here is that the Rome Statute (1998), by which the ICC was founded, regulated the issue of peaceful settlement of disputes among the member states, providing in Article 119 for two mechanisms: 1) any dispute concerning the judicial functions of the ICC shall be settled by the decision of the Court himself while 2) any other dispute between two or more States Parties relating to the interpretation or application of this Statute which is not settled through negotiations within three months of their commencement shall be referred to the Assembly of States Parties, which may itself seek to settle the dispute or may make recommendations on further means of settlement of the dispute. In many respects, the method of peaceful settlement of international disputes based on international agreements, which binds the members of the respective agreement, is specific (Mensah T. 1998, 307-323; Кривокапич Б. 2020, 301-327). Evaluating the legal-political means, one can notice they have similarities with legal methods of resolving disputes, insofar as they are regulated by law, they take place in the procedure provided for by international law, the solution is often referred to the relevant norms of international law, etc., but that of the legal methods they differ in that the dispute is not resolved in court or arbitration, but by an international political or expert body, that the decision is not a verdict, etc. The similarity with diplomatic methods of dispute resolution is that the decision is made by an extrajudicial body, which is much more flexible than a formal court or arbitration procedure, etc., while the difference compared to classic diplomatic means is reflected in the fact that these methods usually lack sufficient confidentiality, that the decision of the body that resolves the dispute may in some cases be legally binding, etc. A good example of the simultaneous presence of legal and political elements is the mechanism accepted in some international organizations, which consists on the fact that the parties to the dispute recognize in advance the decision of a political body (usually the highest body of the organization) as legally binding. There is a similarity with arbitration as a legal way of resolving disputes because the dispute is entrusted to an impartial body whose authority is recognized by both parties and whose decision is binding. However, that mechanism is not arbitration, because the mentioned body is not an elected court, but a political body whose members are not chosen by the parties to the dispute to resolve a specific dispute, but those persons have been delegated by the member states as their permanent representatives to the international organization. Therefore, they do not decide according to their free convictions, but according to the instructions of their government. In addition, the aforementioned body works according to its rules of procedure and not according to the rules of some kind of arbitration procedure. On the other hand, the difference in relation to diplomatic means is that the settlement of international disputes is only one of the functions of the respective body of the international organization; that in principle it can settle only disputes between member states, that in the mentioned case, the decision is binding, etc.

5. CONCLUSION

The scope, complexity, and variety of international relations require the existence of numerous and developed means of peaceful settlement of international disputes. In this sense, one can expect the appearance of some new such mechanisms which may be specialized for certain types of disputes, such as e.g., regarding relations regarding outer space, cyberspace, etc. Still, we must be aware of the simple truth, that for various reasons, all means, even the most perfect ones, sometimes fail. A special problem is the fact that certain states violate the obligation to peacefully resolve international disputes. More precise, the fact is such behavior, especially if it is about a sufficiently powerful state, sometimes it remains without an adequate response from the international community.

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PROSPECTS FOR INVESTMENT IN RENEWABLE AND SUSTAINABLE ENERGIES IN THE AGE OF ARTIFICIAL INTELLIGENCE

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ABSTRACT

This paper aims to provide a deeper understanding of the importance of renewable energy and investment in it. Because renewable energy is one of the world's most important energy sources, it is energy derived from nature, and its sources are renewed with use and consumption. These sources are constantly available in our daily lives, such as sunlight and wind. This paper will shed light on how energy is renewed and how investment in it is financed. Renewable energy is clean and non-polluting, which motivates us to support alternative energies and their role in developing and achieving sustainable energy and financing investment, which meets the demands of the times without causing a deficit in the needs of future generations. It is a time of achievement, development, and reform. Sustainable energy is preparing future generations, and the study will address this matter, along with the technological developments that enable the field of renewable energy technologies to achieve the Sustainable Development Goals. The study focuses primarily on investment and how to employ artificial intelligence, given its tremendous capabilities, which renewable energies rely on, to enhance energy efficiency. This will be detailed in this paper, including the objectives we have reached, in addition to the results and recommendations. Given its vital role in the modern developed world and its close connection to various fields and dimensions of development, one of the most important goals we reached after the study is providing electricity to all, in addition to serious investment in solar, geothermal, and wind energy. This is essential for expanding the scope of renewable infrastructure and technologies, contributing to the development of modern technology and progress, thus providing a pollution-free environment in all developing countries. This makes it an incentive for investment in renewable energy to achieve sustainable development.

Keywords: Artificial intelligence, Investment, Renewable energy, Sustainable development, Technology

1. INTRODUCTION

Renewable energy is energy that is inexhaustible and replenished periodically, for a lifetime, because it is derived from natural resources that are present and available throughout the world, such as the sun, which is the primary, largest, and main source on planet Earth. Wind and water are constantly renewable resources, and hydropower is harnessed through the construction of dams that convert it into kinetic energy, thus generating electricity. Geothermal heat is represented by geothermal energy within the Earth's interior, where heat is produced by the radioactive decay of minerals and the Earth's heat. Among the reasons for our study of this paper is to encourage investment prospects in research and development in technological technologies to create clean sources. Renewable energy reduces the emission of harmful gases such as carbon dioxide. Major climate protection goals cannot be achieved without alternative energy, and the emission of more than 200 million tons of carbon dioxide has been avoided. Therefore, renewable energy is the number one environmental protector. Renewable energy capacity is set to double, as it could contribute to electricity production by approximately 280 billion kilowatt-hours, which will increase available capacity to 111 billion megawatts [1] The use of artificial intelligence in renewable energy investment prospects plays a significant and distinctive role. It is a unique tool in transforming renewable energy applications, due to its enormous capacity to process massive amounts of data. This enables forecasts and a significant reduction in difficult, or rather complex, systems to become a leader in the field of renewable energy sources and achieve sustainable energy.

2. SUSTAINABLE ENERGY AND ITS IMPORTANCE:

Since it is the energy that achieves a balance in meeting existing needs while preserving the needs of future generations, sustainable energy works to rehabilitate and utilize natural resources. After study and research, we were able to conclude that sustainable energy addresses some of the global challenges we face in our daily lives. Its importance can be summarized in the following:

1. Maintaining energy security, Conserving, and reducing energy poverty.
2. Developing economic growth and conserving limited resources.
3. Limiting climate change and Concern for air and water quality.

As the analysis illustrates in the following figure.

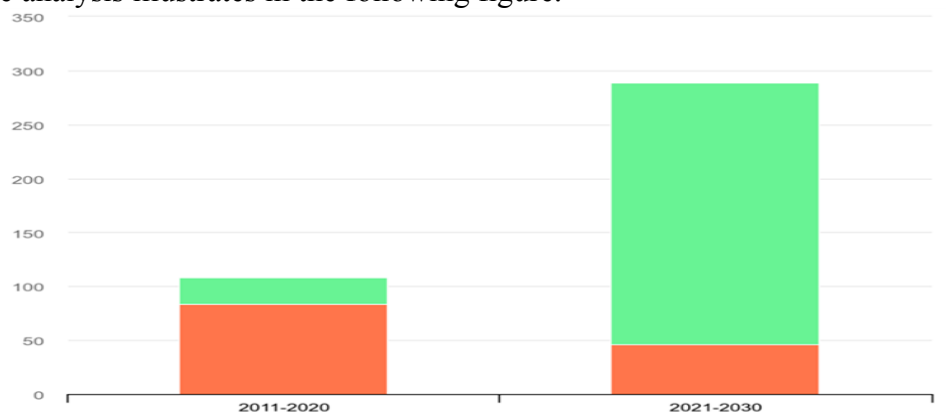


Figure (1) Power generation capacity additions in Africa in the Sustainable Africa scenario, 2011-2030.

[1] Bethe 'S. 'Vath 'B. ' & Lanier 'A. 'Sustainable Development of Renewable Energy Sources 'Nile Arab Group, 2022.

2.1. Sustainable energy sources:

Sustainable energy sources are considered the basic foundation upon which future generations will build, to grow in a more conscious and aware future for a clean environment, because sustainable energy sources are those that have renewable and diverse resources from nature, and enable them to provide a substitute for fossil fuels that are used to produce energy represented in coal, coal, natural gas, and work to reshape the energy represented in the following [2].

1. Renewable energy
2. Solar energy.

However, the sun remains the most powerful and inexhaustible resource. The solar energy balance can be expressed using the following main equation:

$$Q_n = A_c [S - U_L (T_{P_{Iae}} - T_{ambient})]$$

Where S is the absorbed solar radiation, U_L is the total loss, Tepee is the absorber plate temperature, Ambient is the ambient air temperature, and A is the collector surface area. This equation is the cornerstone of energy balance analysis [3].

3. Wind energy
4. Hydroelectric power
5. Thermal energy
6. Biomass energy.

3. TECHNOLOGY AND ARTIFICIAL INTELLIGENCE IN RENEWABLE ENERGY TECHNOLOGIES:

One of the objectives of this paper is the role of technology and artificial intelligence in renewable energy technologies. These technologies play a significant role in improving and developing this energy source. Technology plays a significant role in reducing greenhouse gas emissions and improving air quality. Beyond climate challenges and crises, renewable energy technology plays the greatest role in eliminating these climate challenges, as these technologies work to reduce the occurrence and emission of greenhouse gases [4].

3.1 How Artificial Intelligence Impacts the Development of Renewable Energy use:

These are the points where artificial intelligence has contributed to improving renewable energy:

1. Deriving energy forecasts.
2. Grid distribution and improving smart grids.
3. Advancing continuous maintenance.
4. Advancing energy storage.
5. Advancing production efficiency.
6. Advancing air purification [5].

Artificial intelligence (AI) is playing an increasingly important role in developing the use of renewable energy in multiple ways as shown in Table (1).

[2] Jacques Fermi 'Renewable Energies, 2011.

[3] Yosri Mustafa 'Renewable Energy Resources and Technology, 2023, p. 73.

[4] Lamia Mohsen Muhammad 'Fields of Artificial Intelligence: Applications and Ethics 'Dar Al-Nashr Al-Arabi Publishing and Distribution, 2023.

[5] Uttralytics, "Uttralytics Website," Available: <https://www.uttralytics.com> .

Explain it	Roles
Using AI models to predict energy production based on climate conditions, such as solar radiation or wind speed, helps in better planning for energy distribution.	Energy production forecasting
Applying artificial intelligence in managing smart electricity grids to improve energy distribution and direct it according to actual demand and needs.	Smart Grid Management
Processing large amounts of data to gather insights into consumption and generation patterns, helping to improve energy use strategies.	Big Data Analysis
Using AI to predict when maintenance is needed in renewable systems, reducing costs and improving service reliability.	Predictive maintenance
Using AI to improve the integration of different renewable energy sources (such as solar and wind) to meet energy needs more efficiently.	Promoting the integration of energy sources
Applying artificial intelligence to develop energy storage strategies, helping to achieve a balance between production and consumption.	Improving storage systems
Providing accurate analyses to support decision-makers in developing sustainable energy policies and investing in renewable projects.	Decision support
Artificial intelligence can be used to analyze data from renewable energy systems, such as solar panels or wind turbines, to improve their performance and increase their efficiency.	Improve production efficiency
Using artificial intelligence in educational applications and raising awareness about the benefits of renewable energy and how to use it effectively.	Raising awareness

Table 1:(The role of artificial intelligence in developing the use of renewable energy)

Details	Challenges
Lack of sufficient or accurate data on energy production and consumption, which affects the accuracy of AI models.	Lack of data
Complex renewable energy systems require advanced algorithms, making it increasingly difficult to develop appropriate solutions.	Systems complexity
The cost of developing and implementing AI technologies can be high, which may hinder investment in this field.	Initial cost
AI-based systems can be vulnerable to hacking, posing a risk to the security of electrical grids.	Security challenges
Lack of skills and expertise in AI and renewable energy may limit organizations' ability to adopt these technologies.	skills gap
Integrating AI technologies with existing systems can be complex and require significant changes.	Compatibility with existing systems
If errors occur as a result of the use of AI, it may be difficult to determine responsibility for those errors.	Limitation of Liability
The ever-changing energy market may make forecasts and analyses less accurate.	Market changes
Issues related to privacy and data use, as well as the social and economic impact of the use of artificial intelligence.	Ethical issues
Some AI technologies may require significant resources, which may conflict with sustainability goals.	Environmental challenges

Table 2: (Challenges facing the use of artificial intelligence in the field of renewable energy)

The study addresses the most important and prominent renewable energy sources, including a comparison between the use of technology and artificial intelligence techniques and their challenges in renewable energy in Libya and other countries around the world. It also covers the primary role and objective of this scientific paper, namely the prospects for investing in renewable and sustainable energy.

Here we discuss the most important type of renewable energy, which is how to invest in solar energy, especially solar panels with a high return on investment, because solar panels have become increasingly consumed in recent years to generate electricity, and this development in interest is due to awareness and understanding of the benefits of renewable energy, and the increase in demand for energy requires us to focus on sustainability and clean energy, and this is what we aim for in this scientific paper, and the efficiency of solar energy generation comes only from the efficiency of solar panels, because the efficiency of energy generation is the ability of the solar cell to convert solar energy into electricity, and the greater the efficiency of solar panels, the greater the increase in electricity generation in limited areas [6].

- **How can solar energy be invested?**

To invest in solar energy, certain technologies must be used to ensure high-quality electricity generation. Choosing solar panels plays a major role in energy investment. Therefore, we recommend using panels with an efficiency rate exceeding 23.6%. These solar panels are ranked first by Eco Solar. We recommend using crystal panels because they are among the best solar panels in terms of their efficiency and electricity generation capacity. Using solar panels helps you save money by generating more electricity using fewer panels. We also recommend using the best types of batteries for solar energy. The goals we have reached after this study are for countries and governments that suffer from a constant crisis of power outages, and are difficult to access networks, to direct all citizens to use solar panels, as they are an important measure of the amount of solar radiation (the amount of light) that the solar panels on their surfaces use, which is generated into electricity. This is given that the efficiency of solar panels today generally exceeds 20%, which means that they are capable of converting 1/5 of the absorbed solar energy into electricity, and most of it can be connected to the home grid. Due to the innovative development of photovoltaic technology, the efficiency of home solar panels generally ranges between 20% and 25%, with lower costs and a higher return on investment.

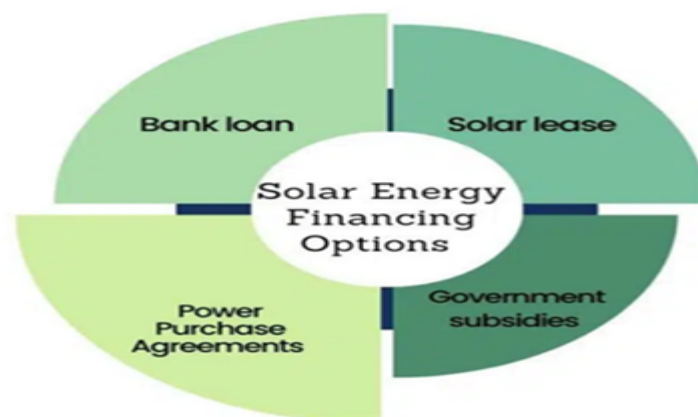


Figure 2: (Investment options in renewable energy)

[6] Yasser Mustafa and Al-Hussein Al-Tahir, Solar Energy: Theory and Application, Arab Nation Foundation Publishing House, 2020.

Explain it	Challenges
These include the cost of technology, the need for long-term financing, and financial risks.	Financial challenges
These include storage problems, fluctuations in natural resources, and difficulties integrating with existing networks.	Technical challenges
Renewable energy support policies, regulatory actors, and the importance of government support.	Political and legal challenges

Table 3: (Challenges facing investment in renewable energy)

Its meaning	Interest
• Reduce electricity bills thanks to power generation and the ability to sell excess energy to the grid.	Cost saving
• Reducing carbon emissions and pollutants and using a renewable energy source helps combat climate change.	Environmental sustainability
• Improve the value of properties with solar energy systems. Solar panels are considered a long-term investment.	Increase property value
• Reducing dependence on traditional energy sources and high fuel prices.	Energy independence
• Supporting local economies and creating new job opportunities in the fields of installing and maintaining solar energy systems.	Job opportunities
• Investing in new technologies can improve efficiency, reduce costs and support innovation.	advanced technology
• Take advantage of financial incentives and tax exemptions provided by governments to encourage the use of renewable energy.	Government incentives
• Reducing water consumption associated with energy production from traditional sources, such as coal or gas.	Water saving

Table 4: (Benefits of investing in solar energy)

4. RISKS OF INVESTING IN RENEWABLE ENERGY:

Investing in renewable energy comes with a number of risks and challenges, including:

1. Power outages
2. Costs
3. Government doubts ^[7]

Operating capacity	Experience	The state
580 MB	The Noor Solar Power Plant project is one of the largest solar power plants in the world, aiming to produce 580 megawatts of energy, offering significant economic and social benefits.	Morocco's experience
From 300 megawatts	The Lake Turkana Wind Farm Project has one of the largest wind farms in Africa, generating more than 300 megawatts of electricity, equivalent to about 15% of Kenya's total energy.	Kenya
From 1000 megawatts	The Rural Village Solar Initiatives Project, the Saur Solar Energy Program in India, ranges from 1 kW to 10 kW per system to a total capacity of 1,000 MW, aiming to provide villages with electricity through small solar power plants.	India
11,000 megawatts	The Sugarcane Bioenergy Project uses sugarcane to produce ethanol, generating approximately 11,000 megawatts of renewable electricity from cogeneration at ethanol and sugar plants as a biofuel. Brazil is one of the world's largest biofuel producers.	Brazil
250 megawatts	The Solar Home Systems Project, an initiative to install solar home systems in rural areas, will reach 250 megawatts, with financial support from the government and NGOs.	Bangladesh

[7] Majid Karim El-Din "Risks of Investing in Renewable Energy Projects," Arab Electricity Magazine, Issue 154, 2023.

133 megawatts	South Africa is experiencing significant growth in its solar energy sector, particularly in rural areas. According to 2024 data, the total capacity of renewable energy projects in the country reached approximately 133 megawatts.	South Africa
117 megawatts	The Tafilah Wind Energy Project is Jordan's first large-scale wind energy project, aiming to generate 117 megawatts of clean energy.	Jordan

Table 5: (Renewable energy experiences in some countries of the world) [8][9][10].

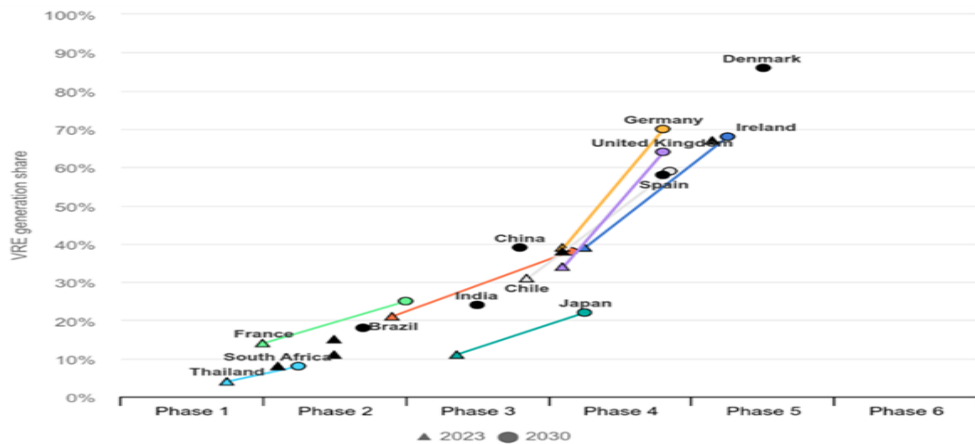


Figure 3: (The phase of integration of variable renewable energy and the proportions of variable renewable energy generation for the selected countries), 2023 and 2030[11].

5. CONCLUSION

1. Renewable energy has proven its importance as a long-term essential component.
2. Renewable energy has the potential to shape the future of global energy production. Global energy production is the same as any investment decision.
3. Comprehensive research and careful evaluation are essential to ensure alignment with defined investment objectives.
4. Any obstacles must be overcome and concerted efforts, innovation, and policy reforms must be made, this will unlock the potential for a more nurturing, cleaner, and pollutant-free environment.
5. We must prioritize and promote sustainable development, which will foster a better future for future generations.
6. Renewable energy is not just an option; it is also a necessity for a sustainable and prosperous future.

[8] The World Bank "Energy Overview" 2023. [Available online]. Available at: <https://www.albankaldawli.org>. [Accessed: January 8, 2025].

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SURFACE CHARACTERISTICS AS A CRITERION FOR FACIAL SKIN CLASSIFICATION USING A CONVOLUTIONAL NEURAL NETWORK

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ABSTRACT

In this study, we aimed to address the question of whether facial skin images captured using modern smartphones can serve as sufficiently effective input data for training a neural network. A classical image classification problem was posed to the neural network, focusing on the microrelief characteristics of skin surface texture. A dataset comprising 4,391 images was prepared, categorized into four classes, and used to train a convolutional neural network implemented using Keras functions within the Python programming environment. Our findings indicate that the answer to the posed question is affirmative: despite the inherent limitations of our approach, the trained neural network achieved an accuracy exceeding 90% in classifying new images. This level of accuracy is deemed satisfactory for applications such as monitoring the effectiveness of cosmetic treatments and other non-medical use cases.

Keywords: *classification, categorization, skin, CNN*

1. INTRODUCTION

Facial skin categorization remains a persistent focus of research, regardless of whether the researchers come from the fields of medicine or cosmetology. To effectively monitor the outcomes of medical or cosmetic treatments and procedures, a reliable tool for assessing the current skin condition is essential. Facial skin images are acquired using a wide variety of devices, including dermatoscopes, laser microscopes, high-resolution cameras, thermal imagers, X-ray machines, and others. In general, the analysis of the skin's surface topography can be divided into two main approaches: 2D and 3D. In medical contexts, high-quality 2D images are most commonly obtained using dermatoscopes, while 3D skin analysis often relies on Scanning Electron Microscopy (SEM). Alongside this sophisticated equipment, the increasing capabilities of modern smartphones have introduced new possibilities for everyday skin imaging. This raises an important question: can the high-resolution, wide color-range cameras found in modern smartphones generate input data suitable for effective facial skin image classification? The condition of facial skin is primarily determined by the presence of wrinkles, pores, skin type, and key attributes such as moisture and oiliness. Over time, the skin's microrelief changes due to aging, medical treatments, cosmetic products, and various physical interventions. In this study, facial skin images were used as input data, classified based on subjective evaluation by a trained specialist. The images were grouped into one of four primary categories - considered the minimal classification granularity necessary for future neural network applications. Beyond demonstrating the usability of such input data as a training dataset for a neural network, the aim of this work is also to highlight the effectiveness of modern library-based tools available for neural network development. Today, researchers have access to a wide range of development environments that simplify the creation of machine learning and artificial intelligence models. In addition to TensorFlow, some of the most widely adopted frameworks include PyTorch (developed by Facebook), Theano, MXNet (developed by Apache and used in Amazon Web Services), CNTK (Microsoft Cognitive Toolkit), JAX (developed by Google), Chainer (developed in Japan), Caffe, and ONNX (Open Neural Network Exchange), which serves as a standard for interoperability among various machine learning environments. For the purposes of our study, the TensorFlow framework was used, although any of the aforementioned platforms could have been employed.

2. RELATED WORK

There is currently no universally accepted nomenclature for categorizing the microrelief of facial skin into a fixed number of classes. Even the terminology used to describe skin topography is not standardized, with classifications varying according to the shape, dimensions, location, and nature of surface irregularities. Terms in circulation include wrinkles, creases, furrows, grooves, folds, lines, and others. In Doris J. Day's work [1], a classification scheme known as The Wrinkle Severity Rating Scale is introduced, proposing five categories of wrinkle severity:

- Grade 1 – Absent (no visible wrinkles),
- Grade 2 – Mild (shallow but visible),
- Grade 3 – Moderate (moderately deep),
- Grade 4 – Severe (very long and deep folds), and
- Grade 5 – Extreme (extremely deep and long folds).

Skin surface changes significantly with aging, influenced by a variety of factors such as the passage of time, genetic predisposition, ultraviolet and infrared radiation exposure, diet, smoking, diseases, hormonal imbalances, and gravitational forces. Each of these contributing factors requires a distinct classification approach, as elegantly illustrated in the study by Quatresooza [2]. The depth and dimensional changes of skin furrows as a result of aging were the subject of investigation in R. Bazin's research [3]. Of particular relevance to our work is the classification proposed in Setaro's study [4], which offers a four-category system for facial skin surface condition based on the visibility of primary and secondary lines and their intersections ("star formations"):

- Category 1: Primary and secondary lines are clearly visible, nearly the same depth, with well-developed star formations.
- Category 2: Lines appear slightly flattened; some star formations remain, but some have vanished.
- Category 3: Some primary lines remain, but secondary lines are nearly gone with little or no star formation.
- Category 4: Primary and secondary lines, as well as star formations, have disappeared, resulting in an almost completely flat skin surface.

D. G. Mercurio [5] proposed a broader clinical classification of facial skin appearance based on texture, hydration, pigmentation, brightness, and oiliness. For texture specifically - referring to the physical surface appearance - he proposed a three-category classification:

- Soft
- Moderate
- Rough

In our work, we adopt a descriptive classification approach to evaluate the facial skin surface condition. This approach does not target a single characteristic but instead aims to incorporate all observable irregularities commonly encountered in practice. To that end, we defined the following four descriptive categories:

- Very Good
- Good
- Poor
- Very Poor

The effectiveness of convolutional neural networks (CNNs) in image classification tasks has been extensively demonstrated in numerous studies over recent years. In particular, the efficiency of the EfficientNet architecture was highlighted in the work of M. Tan [6].

3. MATERIALS AND METHODS

The images used as the dataset for training the neural network were collected over several years of cosmetic practice, during which participants were offered specific cosmetic treatments. A smartphone was used to capture the images, with the majority having a resolution of 3000×4000 pixels. From each image, a $2 \text{ cm} \times 2 \text{ cm}$ region of interest was identified - preferably from the cheek area whenever feasible. This region was then extracted, categorized, and added to the dataset. To ensure consistency in the captured area size and resolution, a ruler was placed alongside the face during image capture, allowing for precise visual marking of the 2 cm length. A total of 4,391 images were collected for this study. The image acquisition and processing workflow is illustrated in Figure 1.

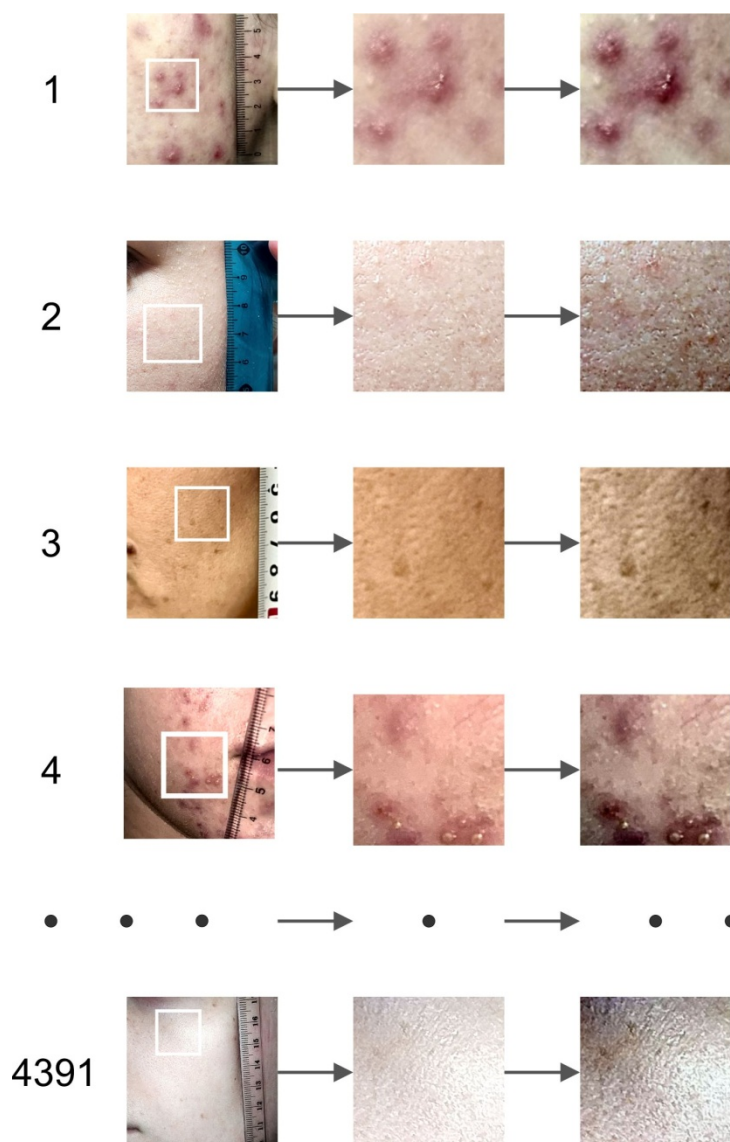


Figure 1. Data preparation.

Within the dataset, each image was assigned to one of four categories based on expert assessment. The class distribution was relatively well - balanced:

- Category 1 (Very Good Condition): 1051 images
- Category 2 (Good Condition): 1120 images
- Category 3 (Poor Condition): 1204 images
- Category 4 (Very Poor Condition): 1016 images

To facilitate the learning process, all images underwent a preprocessing stage, which included gamma correction and gray level adjustment. The original high-resolution RGB images were resized and transformed into 224×224 pixel grayscale images. Due to the relatively limited dataset size, the neural network architecture was adapted accordingly. A simplifying factor was the relatively small number of output classes. The model was developed using the Keras library from the TensorFlow 2 development environment (v2.13.0), running in Python 3.10.12 via JupyterLab. The neural network architecture was based on the EfficientNetV2B0 model. Training was performed using the Adam optimizer, with a learning rate of 0.005, and the sparse categorical crossentropy loss function. The dataset was split into 85% training and 15% validation subsets. Each training batch consisted of 48 images, and the training process was carried out over 300 epochs. To reduce overfitting, data augmentation techniques were employed, including horizontal and vertical flipping and image rotation. Other augmentation methods such as color transformations and zooming were intentionally avoided, as they could compromise the consistency of the skin's microrelief features. The training was executed on a machine running Ubuntu 22.04, utilizing GPU acceleration for faster computation. The convolutional neural network developed for this task falls into the category of relatively lightweight models, with a total of 5,924,436 parameters, of which 5,863,828 are trainable. The architecture of the implemented neural network is shown in Figure 2.

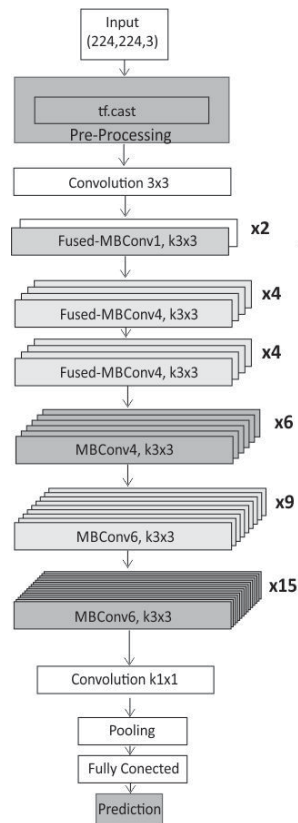


Figure 2. EfficientNetV2B0 architecture

4. RESULTS

With respect to the research question posed in the introduction, the results confirm a positive answer: a modern convolutional neural network can be successfully trained on a relatively small dataset composed of facial skin images captured using smartphone cameras.

The achieved performance could potentially be improved, but several key limitations constrained our approach:

- *Human labeling error*: The most significant challenge was the imperfection of human annotation. Although image classification was conducted by trained professionals, human error is inevitable. Additionally, multiple individuals were involved in labeling, leading to potential inconsistencies. Even a small proportion of mislabeled images can negatively impact both training efficiency and final model accuracy.
- *Imbalanced class distribution*: Initially, categories 1 (very good condition) and 4 (very poor condition) contained significantly fewer images compared to categories 2 and 3. Since balanced class representation is essential for effective model training, the number of images in categories 2 and 3 was reduced to match those of the underrepresented classes. While this ensured class balance, it came at the cost of reducing the overall dataset size.
- *Limited dataset size*: The total number of training instances was modest. Best practices for CNN training - particularly in tasks involving texture classification - recommend at least an order of magnitude more images than we had available. Nonetheless, due to the relatively low number of features required to be extracted by the network, final model performance remained satisfactory.

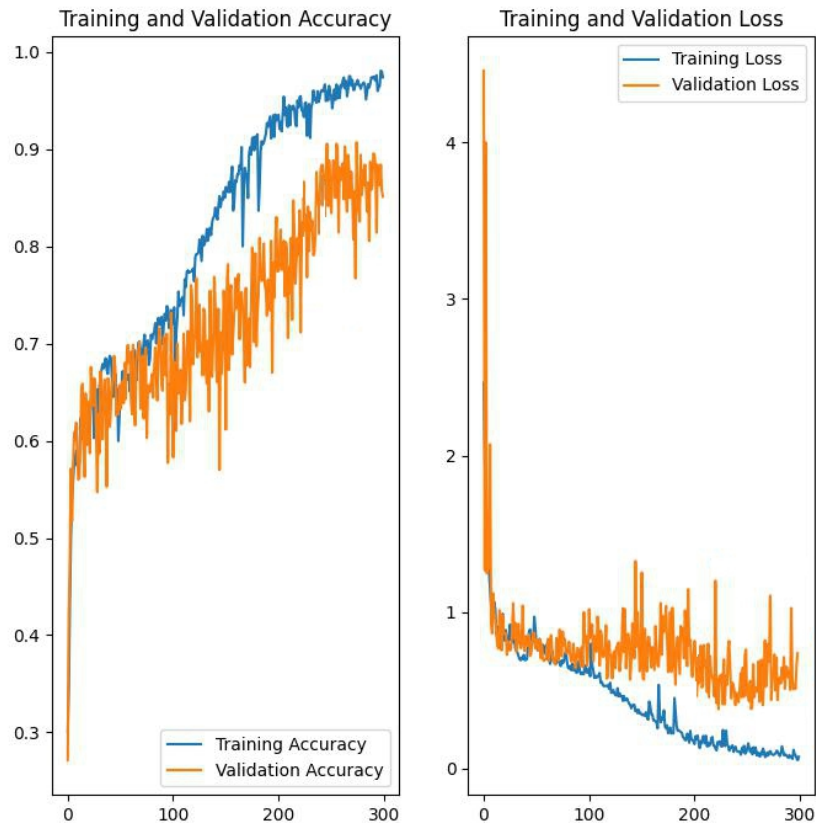


Figure 3. Training and validation accuracy and loss.

In Figure 3, training and validation accuracy/loss curves are presented. Both curves exhibit consistent trends over 300 epochs. The jagged shape of the validation accuracy curve indicates a degree of overfitting, an expected result given the aforementioned limitations. Still, the overall trend is positive - accuracy continues to improve throughout the training process. Extending training beyond 300 epochs yielded no significant gains, with metrics plateauing and beginning to fluctuate near their peak values.

Parameter	Value
Max. training accuracy	98.11%
Max. validation accuracy	90.07%
Prediction accuracy (300 test images)	93.70%

Table 1. Results of the learning and testing process.

Table 1 summarizes the key performance metrics. After training, the model was tested on an independent dataset of 300 previously unseen images, achieving a prediction accuracy of 93.70%. This represents a strong result under the given constraints and confirms the practical feasibility of using smartphone - acquired facial skin images for classification tasks via convolutional neural networks.

5. CONCLUSION

The primary conclusion drawn from this study is that modern neural networks, built using functions integrated into Python-based deep learning libraries, in combination with training data captured via smartphone cameras, represent a simple yet powerful tool in the hands of researchers. The obtained results validate and encourage the viability of using commercially available, easily accessible image data for effective classification tasks. Contemporary smartphones and tablets produce facial skin images of sufficient quality, and real-time, on-device classification is technically feasible. This opens up compelling possibilities for further exploration and development, particularly in real - time applications. The proposed facial skin surface classification approach has the potential to serve as an effective tool for monitoring the impact of cosmetic treatments aimed at improving skin condition. While the method described here is especially applicable to cosmetic interventions, clinical and medical applications would require higher measurement precision and more structured datasets. Nevertheless, in the ongoing pursuit of healthier and more aesthetic skin, a neural network model constructed as outlined in this work can become a highly practical asset in everyday use.

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ENHANCING BANKABILITY IN RENEWABLE ENERGY PROJECTS THROUGH EFFECTIVE RISK MANAGEMENT

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ABSTRACT

To determine the outcome of risk management on the bankability, political /regulatory risk including environmental risk, technology risk and financial risk on the bankability of green energy investments, using survey responses to measure their perceived importance. A survey was conducted in Serbia, in 2024 involving 242 Serbian companies. The research was carried out in collaboration with the Serbian Association of Employers. Twelve factors were identified, three for each variable. Business owners and managers, as the primary respondents, evaluated predefined statements using a Likert scale. Correlation analysis is employed to examine the strength and direction of the relationships between selected variables, helping to identify whether, and to what extent, changes in risk that the bankability of renewable energy projects is significantly influenced by the selected risk factors—namely regulatory, financial, and technological risks. This study factors are associated with variations in the bankability of renewable energy projects. The results revealed provides a meaningful contribution to the existing literature on renewable energy by offering empirical insights into the factors influencing project bankability, with a specific focus on the Balkan region and Serbia. It addresses a regional gap by highlighting how risk management practices impact investment viability in the context of emerging renewable energy markets.

Keywords: *Renewable Energy Investments, Risk Management, Project Bankability, Serbia*

1. INTRODUCTION

Renewable energy is one of the key solutions to deliver low carbon and secure supplies of energy. Years of research and development have brought a number of renewable energy technologies to a stage where they are technologically mature and ready for a more widespread market introduction. However, there is still a gap between renewable energy promoters and financing organizations (Vuković et al., 2023). Traditionally investment in energy infrastructure has always involved risk; however, with the shift toward decarbonization, decentralization, and digitalization, risk management has evolved into a key component of renewable energy strategies. During the early milestones in green energy project development from 1990s and early 2000s, projects were heavily reliant on government subsidies, which masked some of the underlying investment risks. As support mechanisms evolved and markets matured, the emphasis shifted to ensuring project bankability through risk-aware financing structures and private sector engagement (Jevtić et al., 2013).

Risk management in energy investments has evolved alongside the energy transition movement (Figure 1), gaining prominence after the international climate accords of Kyoto (1997) and Paris (2015) (Radović et al., 2013; Mišić et al., 2017). These global accords emphasized the need for clean energy solutions, catalyzing significant investments in renewable technologies. To meet EU binding target of at least 20% green energy in final consumption by 2020, considerable investments are required, €60-70 billion per year end (De Jager, 2011), total annual investments are estimated. These investments will have to come from investors, bankers and equity providers. In contrast to investments in conventional electricity generation, investments in renewable energy sources (RES), such as wind and solar power, require large upfront investments, but low working/operating capital. Most investments are to be made upfront, before the system becomes operational. From an investor's perspective, this means that the overall investment risks increases. To compensate for this risk, investors require a higher rate of return on their investments, leading to increased cost of capital for RES investments. Before investing in a renewable energy project, investors indeed perform a risk analysis to decide whether to invest or not. If investors perceive an investment as risky, they will demand a higher fee for making capital available. The cost of this compensation – the cost of capital - must be paid from the revenues of the projects and, thus, directly influences the cost structure of the project. In that purpose, a field survey was provided in Serbia in 2024, on the sample of 242 Serbian companies to answer the RQ: "What is the influence of regulatory, financial, and technological risks on the bankability of renewable energy investments?" The structure of this paper includes an introduction and a review of relevant literature, followed by the research methodology and results. The conclusion and references are provided in the final sections.

2. LITERATURE REVIEW

Early literature, such as that by Hoffert et al. (2002) and International Energy Agency (2024), underscored the technical, regulatory, and financial risks that distinguish renewables from conventional energy sources. Over time, researchers like Lessard, & Miller (2012) and Painuly (2001), identifying barriers to renewable energy penetration, emphasizing financial and institutional risks have emphasized the role of policy stability, technology maturity, and financial incentives in reducing perceived project risk. Beck & Martinot (2024) discussed public finance mechanisms and risk mitigation in clean energy development, Lessard & Miller (2001) proposed frameworks for risk allocation in large-scale infrastructure projects, Lütken & Michaelowa (2008) examined risk sharing for climate-related investments through carbon finance, UNEP regularly publish reports highlighting the importance of mitigating risk to scale up investment in clean energy. Studies by Dominković et al. (2016), Stojiljković & Radivojević et al. (2020); Josimović & Dedjanski, 2024; Dedjanski et al., 2010), and the Energy Community Secretariat highlight gaps in risk-sharing frameworks in the Balkans. They emphasize the need for: greater transparency in licensing processes, risk-sharing public-private partnerships (PPPs), and stable incentive schemes aligned with EU energy policy. For Serbia and the broader region, implementing comprehensive risk management frameworks ensures: enhanced bankability of projects (attracting lenders and equity investors), better alignment with EU energy goals, and increased social acceptance and environmental sustainability.

3. METHODOLOGY

In Serbia, field research was conducted in 2024 with a sample of 243 enterprises. The research logistics were supported by the Serbian Association of Employers. The online questionnaire focused on the potential impact of three defined independent variables—financial, technology and policy/regulatory risks—on *the bankability of renewable energy investments, considered the dependent variable*. Twelve factors were identified, three for each variable. Business owners and managers, as the primary respondents, evaluated predefined statements using a *Likert scale*. The hypothesis H_0 posits that the independent variables—financial (A), technology (B), and policy/regulatory risk (C) either do not have a direct influence on the dependent variable (*Bankability of renewable energy investments* (D)), or do have an influence, H_1 . For each independent variable, three statements were defined.

A: Financial risk- Enterprise and Stakeholders-Level Statements

The reason financial risk is chosen as Independent Variable A in this research lies in its critical influence on the financial viability of renewable energy projects. Financial risk refers to the potential for monetary loss or underperformance due to factors such as limited capital availability, cost overruns, market fluctuations, and uncertain returns on investment. In the context of renewable energy, this risk is amplified by high upfront costs, reliance on policy incentives, and evolving market dynamics—all of which can significantly impact a project's bankability and its ability to attract external financing.

- *a1. High initial capital requirements reduce the attractiveness of renewable energy projects to investors.*
- *a2. Financial institutions show greater willingness to fund renewable energy projects that demonstrate strong management of technology, policy, and market risks*
- *a3. Inaccurate financial forecasting contributes to underperformance and low investor trust.*

B. Technology- Enterprise -Level Statements

This type of risk arises from the potential for technological underperformance, obsolescence, or failure—factors that may impede project implementation, increase operational and maintenance costs, or reduce expected energy output. In the context of green power, where many technologies are still evolving or rapidly advancing, technology risk can significantly affect project success, influencing timelines, investment returns, and long-term sustainability.

- *b1. Renewable energy projects that use proven and commercially mature technologies are perceived as more bankable due to reduced technological uncertainties.*
- *b2. The risk that the technology may require more maintenance than initially anticipated or those failures in technology performance could disrupt energy generation and decrease revenue streams.*
- *b3. Rapid technological obsolescence in some renewable technologies creates uncertainty for long-term investment returns.*
-

C. Policy/Regulatory risk- National /Institutional- Level Statements:

Thus risk refers to the uncertainty and potential negative impact on renewable energy projects arising from changes or inconsistencies in government policies, regulations, and legal frameworks. Common sources of regulatory risk include changes in taxation laws, feed-in tariffs, licensing procedures, environmental regulations, and lack of clarity or enforcement in legal frameworks. A transparent regulatory framework and a stable policy environment increase the financial attractiveness and bankability of renewable energy investments.

- *c.1 Strong and consistent government commitment to renewable energy policies increases the likelihood of project financing and success*
- *c2. The absence of a stable legal framework for power purchase agreements (PPAs), environmental and energy regulations jeopardizes project bankability.*
- *c3. Delays in obtaining necessary permits and approvals negatively affect the timeline and bankability of projects.*

D. Bankability of renewable energy investments- Enterprise/Stakeholders- Level Statements

Bankability which measures how likely a renewable energy project is to secure the necessary funding and successfully reach commercial operation, minimizing risks to lenders and investors, is considered dependent variable in the research (D), with further claims:

- *d1. Robust risk identification and mitigation strategies significantly enhance the bankability of renewable energy investment projects.*
- *d2. A thorough risk assessment, including sensitivity analyses and stress testing, strengthens the project's ability to secure financing.*
- *d3. Stakeholder engagement and community acceptance contribute to lowering social and political risks, thereby improving overall project bankability.*

3.1 Results

In Table 2. Are presented results of values for claims (ABCD).

Claim	Central Tendency		Spread	Spread Measure	Lopsidedness		Tail Weight	
	Data Point	Error Margin	Data Point	Error Margin	Data Point	Error Margin	Data Point	Error Margin
<i>A Financial risk</i>								
a1. High initial capital requirements reduce the attractiveness of renewable energy projects to investors.	4,42	0,042	0,660	0,436	-0,711	0,156	-0,553	0,312
a2. Financial institutions show greater willingness to fund renewable energy projects that demonstrate strong management of technology, policy, and market risks.	4,38	0,040	0,627	0,393	-0,488	0,156	-0,643	0,312
a3. Inaccurate financial forecasting contributes to underperformance and low investor trust.	4,35	0,036	0,558	0,312	-0,401	0,156	1,036	0,312
<i>B. Technology risk</i>								
b1. Renewable energy projects that use proven and commercially mature technologies are perceived as more bankable due to reduced technological uncertainties.	4,33	0,047	0,727	0,528	-0,851	0,156	0,302	0,312
b2. The risk that the technology may require more maintenance than initially anticipated or those failures in technology performance could disrupt energy generation and decrease revenue streams.	3,86	0,037	0,571	0,326	-0,006	0,156	-0,070	0,312
b3. Rapid technological obsolescence in some renewable technologies creates uncertainty for long-term investment returns.	4,31	0,040	0,625	0,391	-0,346	0,156	-0,659	0,312
<i>C. Polic/regulatory risk</i>								
c1. Strong and consistent government commitment to renewable energy policies increases the likelihood of project financing and success	4,48	0,036	0,563	0,317	-0,497	0,156	-0,771	0,312
c2. The absence of a stable legal framework for power purchase agreements (PPAs), environmental and energy regulations jeopardizes project bankability.	4,11	0,038	0,595	0,354	-0,274	0,156	0,773	0,312
c3. Delays in obtaining necessary permits and approvals negatively affect the timeline and bankability of projects.	4,40	0,043	0,669	0,448	-0,831	0,156	0,284	0,312

D. Bankability of renewable energy investments								
d1. Robust risk identification and mitigation strategies significantly enhance the bankability of renewable energy investment projects.	3,95	0,034	0,525	0,276	-0,748	0,156	3,078	0,312
d2. A thorough risk assessment, including sensitivity analyses and stress testing, strengthens the project's ability to secure financing	4,16	0,036	0,554	0,307	0,054	0,156	0,006	0,312
d3. Stakeholder engagement and community acceptance contribute to lowering social and political risks, thereby improving overall project bankability.	4,36	0,036	0,562	0,315	-0,438	0,156	1,002	0,312

*Table 1: Values for claims (ABC&D)
(Source: Authors)*

Considering the statistical values provided in Table 1, the following conclusions can be inferred: Average Scores indicate that the general ratings range from 3.86 to 4.48. The highest mean value was recorded for variant c1 (4.48), while the lowest was for b2 (3.86). This suggests that most variants have relatively high average ratings, with some, like b2, receiving lower evaluations. Measure of Dispersion ranges from 0.036 (for a3, c1, d2, d3) to 0.047 (for b1). These values suggest that most data points are closely grouped around the mean, with slight variations. The variances follow a similar pattern, typically remaining low, indicating limited data spread. Skewness indicates that the data is generally slightly negatively skewed, with most values clustering towards the higher end of the scale. For instance, variants a1 (-0.711) and b1 (-0.851) exhibit significant negative skewness, suggesting that scores are mainly concentrated at the upper values, while b2 (-0.006) and d2 (0.054) show minimal or nearly neutral skewness. Distribution Shape indicates that most variants have relatively flat distributions, meaning the data is spread out rather than concentrated in the middle. Variants like a3 (1.036) and d1 (3.078) show higher values, suggesting more outliers or peaks. In contrast, variants like b2 and d2 exhibit slight negative kurtosis, indicating a wider distribution. The data show that most variants have high average values with little variation. Skewness and kurtosis suggest that the data are slightly asymmetrical, with some variants deviating from a normal distribution, potentially reflecting sensitivity to specific factors. Overall, the dataset offers valuable insights into variant behavior, focusing on central tendencies, dispersion, and distribution shape, which can inform further analysis.

Predictive Model's Performance Evaluation. Considering the statistical values provided in Table 1, the following conclusions can be inferred: Correlation Strength (R) is 0.850, indicating a strong positive relationship between the independent and dependent variables. This suggests that the model has good predictive power and a significant association between the predictors and the outcome. The adjusted fit index is 0.720, nearly identical to the R-squared. It indicates that the model remains effective after considering the number of predictors, providing a more reliable measure of model quality, especially when comparing models with varying predictors. The forecast error is 0.22692, representing the average deviation in predicting the dependent variable. A smaller value signifies greater accuracy, indicating that the model provides relatively precise predictions. The model demonstrates strong explanatory power, with an R value of 0.850, indicating a robust correlation between the predictor and target variable. The explained variance of 72.3% shows the model explains most of variance, while the Tucker-Lewis Index confirms its effectiveness even with multiple predictors. The forecast error of 0.22692 indicates accurate predictions, though there is potential for further improvement.

Model	R	Explained Variance	Corrected R Square	Residual Standard Error
	0,850	0,723	0,720	0,22692

Table 2. Model Summary
Source (Authors)

As shown in Table 3 the ANOVA lead to the following conclusions: Regression Sum of Squares is 32,006, representing the variation explained by the model and how well the predictors account for the dependent variable. Residual Sum of Squares is 12,255, representing the unexplained variation not accounted for by the model. A smaller value indicates better model fit. Total Variation is 44,261, total variance, representing the overall variation in the data. Freedom Degrees for regression is 3, corresponding to the number of predictors.

The degrees for residuals is 238, and for total variation, it is 241. Average Square for regression is 10.669, calculated by dividing the regression sum of squares (32.006) based on its variance components (3). The root mean square for the residuals is 0.051, calculated by dividing the variance from the error term (12.255) by its corresponding statistical parameters (238). The F-statistic is 207.186, computed by dividing the mean square for the regression model (10.669) by the residual mean square (0.051).

A high value indicates strong explanatory power and model validity. The confidence level is 0.000, under the 0.05 limit, indicating that the model is statistically significant and the relationship between variables is likely genuine. The ANOVA results confirm the model's statistical significance. A high F-ratio of 207.186 and a very strong evidence against the null hypothesis (0.000) demonstrate a meaningful association between the predictors and the outcome variable, with the model effectively explaining the data variation [$F(3,238) = 207.186$, $p < 0.0001$].

The model accounts for a substantial portion of the total variation (regression sum of squares = 32.006), while the remaining variation (residual sum of squares) is minimal and does not undermine the model's validity. Therefore, the null hypothesis (H_0 : A, B, and C do not shape D) **Is ruled out, with the alternative hypothesis being favored** (H_1 : A, B, and C influence D).

ANOVA					
Model	Squared deviations	df	Variance estimate	F	Sig.
Outcome prediction	32,006	3	10,669	207,186	0,000
Residual	12,255	238	0,051		
Total	44,261	241			

Table 3. Variance Analysis Results
Source (Authors)

The predictor estimates in Table 4 support the following conclusions:

Raw coefficient estimates Capture the unique effect of each predictor on the outcome variable in their original units (Fig 1):

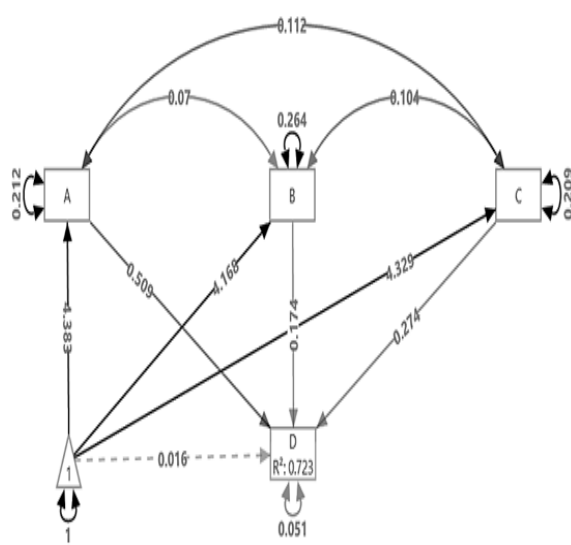


Figure 1. Raw coefficient estimate
Source (Authors)

Baseline value is 0.016 (SE = 0.169), indicating the expected outcome when all predictors (A, B, C) are zero. Its closeness to zero suggests minimal deviation in the dependent variable at that point. Effect estimate for A is 0.509 (SE = 0.038), indicating that a one-unit increase in A raises the dependent variable by 0.509, holding other variables constant. Effect estimate for B is 0.174 (SE = 0.032), meaning a one-unit rise in B increases the outcome by 0.174. Effect estimate for C is 0.274 (SE = 0.040), suggesting a similar positive impact from C.

Beta weights (Fig. 2) show the relative impact of each predictor on the outcome using standardized values.

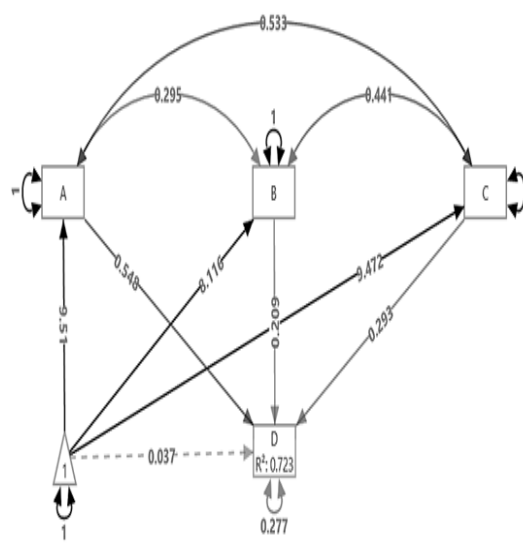


Figure 2. Beta weights
Source (Authors)

A ($\beta = 0.548$) has the strongest effect, indicating it's the most influential variable. B ($\beta = 0.209$) has a moderate impact. C ($\beta = 0.293$) also contributes significantly, though less than A.

t-scores **and** significance levels indicate the statistical relevance of the **effect estimates**. All predictors—A (13.564), B (5.477), and C (6.811)—show high **t-scores with** p-values of 0.000, confirming that each has a significant impact on the dependent variable. Variables A, B, and C are significant predictors of the dependent variable ($p < 0.05$), with A showing the strongest effect ($\beta = 0.548$). All **regression weights** are positive, indicating that increases in A, B, or C lead to increases in the outcome. These results confirm the model's predictive validity and the meaningful contribution of all predictors.

Model	Raw coefficient estimates		Beta weights	t	Sig.
	B	Estimated stand. dev.	Beta		
(Constant)	0,016	0,169		0,093	0,926
A	0,509	0,038	0,548	13,564	0,000
B	0,174	0,032	0,209	5,477	0,000
C	0,274	0,040	0,293	6,811	0,000

Table 4. Weights
Source (Authors)

The predictive model allows for the evaluation of how changes in variables A, B, and C impact the dependent variable D. The parameter estimates from Table 4 illustrate the magnitude and positive direction of influence for each independent variable (A, B, and C) on D, providing deeper insight into their relationships. The linear predictive equation (formula 1) is:

$$D = 0.016 + 0.509 \cdot A + 0.174 \cdot B + 0.274 \cdot C \quad (1)$$

The predictive model provides valuable insight into the data (Table 5), as the predicted values have an average of 4.1584 and a small standard deviation of 0.36442.

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	3,2059	4,8011	4,1584	0,36442	242
Residual	-,99657	1,19373	0,00000	0,22550	
Std. Predicted Value	-2,614	1,764	0,000	1,000	
Std. Residual	-4,392	5,261	0,000	0,994	

Table 5. Deviation Metrics

Source (Authors)

The prediction error metrics(residual) have an average close to 0, suggesting that the model is not systematically biased.

4. CONCLUSION

The findings of this research confirm that the bankability of renewable energy projects is significantly influenced by the selected risk factors—namely regulatory, financial, and technological risks—demonstrating its role as a dependent variable in the analysis. Bankability, in this context, refers to the extent to which a project is perceived as financially viable, creditworthy, and capable of securing external financing from banks, investors, and lending institutions. The study reaffirms that a renewable energy project is considered bankable when it meets several critical criteria, including a robust technical design with proven technology, a sound financial structure supported by credible revenue sources such as long-term Power Purchase Agreements, and comprehensive risk management strategies that address key project uncertainties. Additionally, the presence of a qualified project team, compliance with legal and environmental standards, secure ownership and land use rights, and a stable, transparent regulatory environment further enhance the project's ability to attract financing. These findings underscore the importance of integrated risk assessment and mitigation in improving project bankability, particularly in the evolving and capital-intensive landscape of renewable energy development. Future studies could compare the impact of risk factors on renewable energy project bankability across different regions in the Balkans or between Balkan and EU countries to identify common patterns and region-specific challenges; investigate how the influence of financial, regulatory, and technological risks evolves over time as policy frameworks and market maturity change would offer valuable dynamic insights.

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IMPROVING LANGUAGE SKILLS USING ARTIFICIAL INTELLIGENCE

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ABSTRACT

Artificial intelligence (AI) and machine learning (ML) represent two interconnected concepts that have transformed the way we communicate, learn and work. All different applications are based on a common set of ideas, relying on algorithms, linguistics, logic, statistics, etc. In this paper, we present a Natural language processing (NLP) tool for text analysis, including sentiment analysis. In this case, the tone of the text is analyzed (positive, neutral, negative) and entities and key phrases are recognized. It can be used by applying two methods of text analysis. Supervised solving implies that the first step in the procedure is to bring the training data set to the learning input. Based on that set, the model "learns" connections and later applies the learned logic to a new set, never seen before. Unsupervised solving does not involve a training set, but relies on its own techniques for finding hidden knowledge. The goal of natural language processing is to provide new computing capabilities around human language: for example, extracting information from texts, translating between languages, answering questions, having a conversation with a computer, receiving instructions, and so on. Artificial intelligence tools have built-in writing functions that refine content by checking spelling, grammar, and tone and making other suggestions for improvement. By pulling in a large database of grammar and spelling rules, AI uses sophisticated algorithms to analyze text, compare text with common mistakes, and suggest changes. Built-in plagiarism detection is a huge advantage of AI writing. The paper will present the ways in which it is possible to improve these language skills.

Keywords: *Machine learning applications, Natural language processing techniques, Sentiment analysis, Language generation, Artificial intelligence*

1. INTRODUCTION

The specific goals of the paper are to present the techniques for analyzing and correcting the text and to enable the reader to use them without major problems. Natural language processing is a set of methods that make human language accessible to computer systems.

In the past ten years, natural language processing has become embedded in our daily lives: automatic machine translation is ubiquitous on the web and social media, text classification prevents emails from falling under the flood of spam, browsers have gone beyond string matching and network analysis to a high degree of linguistic sophistication, dialog systems provide an increasingly common and useful way to obtain and share information. Natural language processing is relevant to this goal in several ways. The ability to speak is one of the fundamental characteristics of human intelligence, and no artificial intelligence program could be said to be complete without the ability to communicate with words. Much of artificial intelligence research is devoted to developing systems that can reason from premise to conclusion, but such algorithms are only as good as they say (Dreyfus, 1992). Natural language processing is a potential solution to the "knowledge bottleneck", by acquiring knowledge from natural language texts, and perhaps from conversations. The study of computer systems is also relevant to natural language processing. Processing large datasets of unlabeled text indicates the application of parallelization techniques such as MapReduce (Dean and Ghemawat, 2008; Lin and Dyer, 2010). When deep neural networks are implemented in such systems, it is possible to achieve a speed increase using techniques such as reduced precision arithmetic (Wu et al., 2016). When applied to language processing, these concepts enable computers to understand, interpret, and generate human language, opening up new possibilities in many fields, including education, business, and everyday life. This paper explores the interaction between artificial intelligence, machine learning and language, considering their applications, challenges and future. Artificial intelligence has become an integral part of modern education, especially when it comes to improving language skills. As technology develops, so do the ways in which we learn and improve language. AI offers innovative methods and tools that enable users to learn, practice and apply language skills more efficiently, Figure 1.

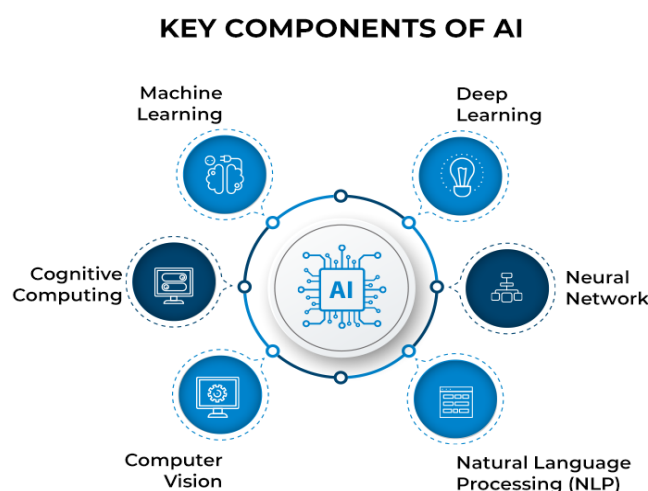


Figure 1. Elements of artificial intelligence [16]

Artificial intelligence is a broad field that deals with the development of systems capable of performing tasks that usually require human intelligence. These tasks may include language comprehension, image recognition, decision making, and problem solving. Machine learning, as a subset of artificial intelligence, focuses on algorithms and models that enable computers to learn from data. Rather than being explicitly programmed for each individual function, machine learning systems, Figure 2, use data to recognize patterns and make decisions. The two most commonly used methods of machine learning are inductive learning or supervised learning and self-training or unsupervised learning. The difference between the two mentioned machine learning methods is that in supervised learning the target attribute is known, while in unsupervised learning the target is unknown.

In the case of supervised learning, the model training data consists of a set of training examples that also contain the target attribute. Thus, in supervised learning, machine learning algorithms based on data realize a classifier (if the target attributes are discrete values) or a regression function (if the target attributes are continuous values) which is used to predict the target attribute of future data. Machine learning techniques are also used to recognize objects, text and speech.

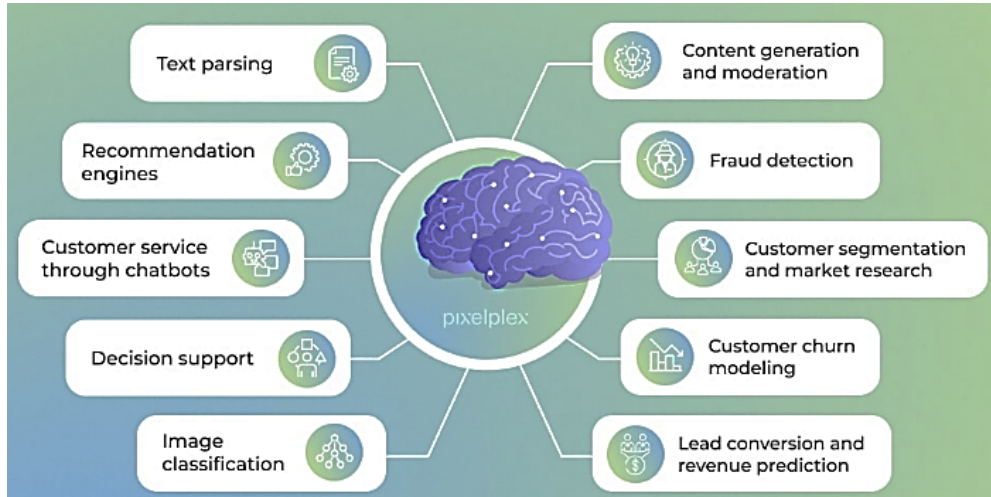


Figure 2. Applications of machine learning [17]

Modern approaches to natural language processing rely heavily on machine learning, which enables the creation of complex computer programs from examples. Machine learning provides a number of general techniques for tasks like converting a sequence of discrete tokens in one vocabulary to a sequence of discrete tokens in another vocabulary—a generalization of what normal people might call "translation." Much of today's natural language processing research can be considered an application of machine learning. However, natural language processing has characteristics that distinguish it from many other machine learning application domains. Unlike images or sound, textual data is fundamentally discrete, with meaning created by the combinatorial arrangement of symbolic units. This is especially important for applications where text is the output, such as translation and compression, as it cannot gradually converge to the optimal solution. Although the set of words is discrete, new words are always created. Furthermore, the distribution by words (and other linguistic elements) resembles a power law distribution (Zipf, 1949). The consequence of this is that natural language processing algorithms must be particularly robust to observations that do not appear in the training data. Language is recursive: units such as words can be combined to form phrases, which can be combined by the same principles to form larger phrases, etc.

Facebook and Google Plus

They altogether use automatic face identification in images. The recognition of letters and numbers through the classification of manuscripts is a problem that, in addition to modern ones, is also relevant in the domain of historical documents for the purpose of forming digital libraries. The digital assistant, another one in a series of machine learning applications, has been in use since the late 1990s. Recently, Google Now, Siri and Copilot are the most commonly used virtual assistants that show exceptional reliability in the domain of voice and text recognition. Google Translate is a tool that is used to translate text in almost a hundred different languages, although human intervention is still necessary to obtain quality translated text.

2. APPLICATIONS OF AI AND ML IN LANGUAGE PROCESSING

These applications allow:

Automatic translation: One of the most significant applications of AI and ML in language processing is automatic translation. Services like Google Translate use deep neural networks and sequence-based models to translate text between different languages. This progress enables global communication and reduces language barriers.

Chatbots and Virtual Assistants: Chatbots like Siri, Alexa and Google Assistant use NLP (Natural Language Processing) with the support of machine learning to understand user requests and generate responses. These tools not only automate customer support, but also improve the customer experience.

Sentiment Analysis: Sentiment analysis tools use machine learning models to assess the emotional tone of texts, such as product reviews or social media posts. This technology helps companies understand consumer attitudes and adapt their strategies.

Text generation: Models like GPT (Generative Pre-trained Transformer) are capable of generating coherent and natural text based on input. These systems are used to create content, written articles, and even fiction, opening up new possibilities in creative writing.

One of the most significant advantages of applying AI in education is the possibility of personalized learning. AI systems can analyze the learning style and progress of individual students to adapt content and teaching methods. For example, apps like Duolingo use AI algorithms to provide users with customized exercises that match their level of knowledge and pace of learning. This personalization makes learning more efficient and motivates students to continue practising. Duolingo is a fun, free app for learning more than 40 languages through quick lessons and different interfaces. We can practice speaking, reading, listening and writing to build our vocabulary and grammar skills. Designed by language experts and used by hundreds of millions of learners worldwide, Duolingo helps us prepare for real conversations in Spanish, French, Chinese, Italian, German, English and more. AI enables the development of interactive tools that enrich the language learning experience. Chatbots, such as those integrated into language learning applications, allow users to practice conversation in real time. These tools use Natural Language Processing (NLP) to understand user inputs and responses, providing users with real-time feedback and corrections. This creates a feeling of interaction and engagement that is similar to a real conversation.

AI also facilitates the process of translation and language correction. Tools like Google Translate use machine learning to improve translation accuracy, allowing users to quickly translate texts and communicate in foreign languages. Learning new words and phrases becomes easier thanks to these tools, because users can see examples of the use of words in different contexts. In addition, spelling and grammar tools such as Grammarly use AI to analyze text and provide users with advice on improving writing style and accuracy. AI can significantly improve listening and speaking skills. Language learning apps often offer audio content that allows users to listen to native speakers. Speech recognition algorithms, such as Google Voice, allow users to practice pronunciation and receive feedback on accuracy. These technologies help students overcome barriers that may arise due to the fear of making mistakes when speaking in a foreign language.

3. NATURAL LANGUAGE PROCESSING (NLP)

It represents a branch of artificial intelligence that deals with the interaction between computers and human language. The goal of NLP is to enable computers to understand, interpret and generate human language in a way that is useful and meaningful. The combination of machine learning and natural language processing has opened the door to new possibilities in data analysis, automation and communication, making it one of the most exciting fields in modern technology. The origins of natural language processing date back to the 1950s, when researchers began using simple rule -based approaches to language translation. Over the years, the development of machine learning, especially deep learning, has significantly advanced NLP. In the last few years, models such as RNN (Recurring Neuron Network), LSTM (Long Short-Term Memory), and transformer models, such as BERT (Bidirectional Encoder Representations from Transformers) and GPT (Generative Pre-trained Transformer), have enabled extremely high results in language understanding. NLP stands for natural language processing, which is a fascinating and rapidly developing field that encompasses computer science, artificial intelligence and linguistics. NLP focuses on the interaction between computers and human language, enabling them to understand, interpret, generate and analyze human language in a way that is both meaningful and useful. With the increasing amount of textual data generated every day, from social media posts to research articles, NLP has become an essential tool for extracting valuable decisions and automating various tasks. NLP uses computational linguistics, which studies how language works, and various models based on statistics, machine learning, and deep learning. These technologies allow computers to analyze and process text or voice data and to understand its full meaning, including the intentions and emotions of the speaker or writer. NLP powers many applications that use language for text translation, voice recognition, text summarization, and chatbots. You may have used some of these applications yourself, such as voice-controlled GPS systems, speech-to-text software, etc., Figure 3.



Figure 3. Natural language processing

NLP text preprocessing	It prepares the raw text for analysis by converting it into a format that can be more easily understood by the machine. It starts with tokenization, which involves dividing the text into smaller units such as words, sentences or phrases. This helps break down complex text into manageable chunks.
Feature extraction	This is the process of converting raw text into numerical representations that machines can analyze and interpret. It includes converting text into structured data using NLP techniques such as Bag of Words that record semantic relationships between words.
Text analysis	This process includes tasks such as part-of-speech tagging, which identifies the grammatical roles of words, and named entity recognition, which detects specific entities such as names, locations, and dates. Parsing analyzes the grammatical relationships between words in order to understand the structure of the sentence, while sentiment analysis determines the emotional tone of the text.
Model training	The processed data is then used to train machine learning models, which learn patterns and relationships within the data. During training, the model adjusts its parameters to reduce errors and improve its performance.

3.1 Key Concepts of NLP

Tokenization: The process of breaking down text into smaller units, known as tokens, which can be words, phrases, or sentences. This step is crucial for text analysis. Sentence tokenization breaks down text into individual parts. It's not just about periods - it deals with complex punctuation and grammar rules. For example, in the Python language it would look like:

```
from nltk.tokenize import word_tokenize
text = "NLP is fascinating."
tokens = word_tokenize(text)
print( tokens)
# Output: ['NLP', 'is', 'fascinating', '.']
```

Stemming and lemmatization: Stemming is a process of linguistic normalization in natural language processing and information retrieval. Its primary goal is to reduce words to their base or root form, known as the root. Rooting helps group words with similar meanings or roots together, even if they have different inflections, prefixes, or suffixes. These techniques are used to reduce words to their basic form. Stemming shortens words to the root, while lemmatization takes into account the context of the word to arrive at its lexicographic form. It is a common technique of annotation of electronic content, which is carried out in order to prepare it for linguistic analysis or lexicographic work. The procedure implies that each word used in the given text is given appropriate information about its type and the form in which it is found.

Named Entity Recognition: (NER) implies identification and classification of key information in a text, such as names, locations, dates, and other specific information. It identifies predefined categories of objects in the body of the text and classifies the entities related to each category. They involve training an AI-driven machine learning model on a labeled data set using algorithms such as conditional random fields and maximum entropy (two types of complex statistical language models).

Sentiment analysis: (SA) is a methodology used to determine the emotional tone of the text, such as positive, negative or neutral feelings. The understanding of human language is supported by artificial intelligence, and all this is thanks to the analysis of sentiment in NLP. This technique allows machines to measure human opinions, emotions and attitudes from textual data. Sentiment analysis, also known as thought research, is a fundamental technique within NLP for mood analysis. It determines the opinion expressed in the text, whether positive, negative or neutral. By interpreting subjective information and emotional tone, opinions can be analyzed to a large extent. For example, companies can assess customer satisfaction by examining feedback from millions of reviews.

Language generation: (NLG - Natural Language Generation) is a technique that allows computers to create text that sounds natural. This technology is used in chatbots, automatic translation and content creation. There are six steps to implement this procedure, Figure 4:

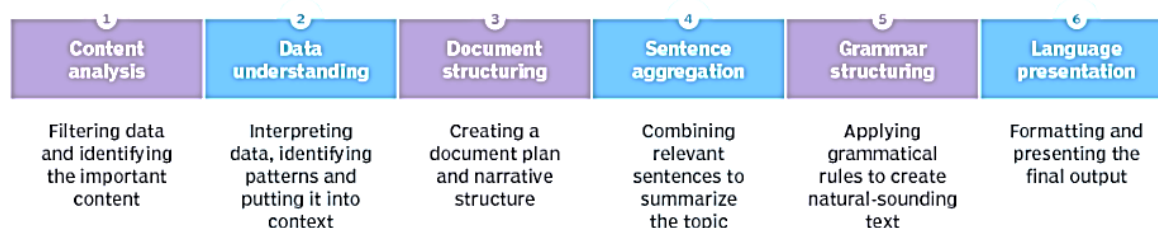


Figure 4. Natural language generation

Content analysis. The data is filtered to determine what should be included in the content produced at the end of the process. This phase involves identifying the main themes in the original document and the relationships between them.

Understanding data. Data is interpreted, patterns are identified and put into context. Machine learning is often used at this stage.

Document structuring. A document plan is created and a narrative structure is selected based on the type of data to be interpreted.

Sentence aggregation. Relevant sentences or parts of sentences are combined in ways that accurately summarize the topic.

Grammatical structuring. Grammatical rules are applied to create text that sounds natural. The program deduces the syntactic structure of a sentence. It then uses this information to rewrite the sentence in a grammatically correct way.

Language presentation. The final output is generated based on a template or format selected by the user or developer.

NLP combines the power of computational linguistics together with machine learning algorithms and deep learning. Computational linguistics uses data science to analyze language and speech. It includes two main types of analysis: syntactic analysis and semantic analysis. Syntactic analysis determines the meaning of a word, phrase or sentence by parsing the syntax of the word and applying pre-programmed grammatical rules. Semantic analysis uses syntactic output to extract meaning from words and interpret their meaning within the sentence structure.

4. AI LANGUAGE CORRECTION AND TRANSLATION

AI also facilitates the process of translation and language correction. Tools like Google Translate use machine learning to improve translation accuracy, allowing users to quickly translate texts and communicate in foreign languages. Learning new words and phrases becomes easier thanks to these tools, because users can see examples of the use of words in different contexts. In addition, spelling and grammar tools such as Grammarly use AI to analyze text and provide users with advice on improving writing style and accuracy. Google Neural Machine Translation (GNMT) was a neural machine translation (NMT) system developed by Google and introduced in 2016, which used an artificial neural network to increase fluency and accuracy in Google Translate. It used the WordPiece tokenizer and a stack search decoding strategy. It worked on the Tensor Processing unit. In 2020, the system was replaced by another deep learning system based on Transformer encoder and RNN decoder. GNMT has improved the quality of translation by applying an example-based machine translation method in which the system learns from millions of examples of language translations.

4.1 Development of listening and speaking applications

AI can significantly improve listening and speaking skills. Language learning apps often offer audio content that allows users to listen to native speakers. Speech recognition algorithms, such as Google Voice, allow users to practice pronunciation and receive feedback on accuracy. These technologies help students overcome barriers that may arise due to the fear of making mistakes when speaking in a foreign language. Speech recognition is a complex field that has developed significantly over the years. Several algorithms and models have proven useful for speech recognition tasks:

1. **Hidden Markov Models (HMM):** Traditionally used for speech recognition, HMM models the temporal variability of speech. It works well for recognizing phonemes and words in a sequence.
2. **Deep Neural Networks (DNN):** DNNs have replaced HMMs in modern systems. They can learn complex patterns about data and are used for feature extraction and classification in speech recognition.
3. **Recurrent Neural Networks (RNN):** RNNs, especially long-short-term memory (LSTM) networks, are suitable for sequential data like speech because they can maintain context over time. They are often used in combination with CNNs.

Since its launch in 2009, Google Voice transcription has used Gaussian Mixture Model (GMM) acoustic models, the cutting-edge technology in speech recognition. Sophisticated techniques such as adapting the model to the speaker's voice have extended this relatively simple modeling method. Then around 2012 deep neural networks (DNN) revolutionized the field of speech recognition. These multi-layer networks discriminate sounds better than GMMs by using "discriminative training", distinguishing between phonetic units instead of modeling each one separately. But things got really fast with Recurrent Neural Networks (RNNs).

Comparison of DNN and Long Short Term Memory (LSTM): RNNs have additional recurrent connections and memory cells that allow them to "remember" the data they have seen so far, just as we interpret the words we hear based on the previous words in the sentence, Figure 5.

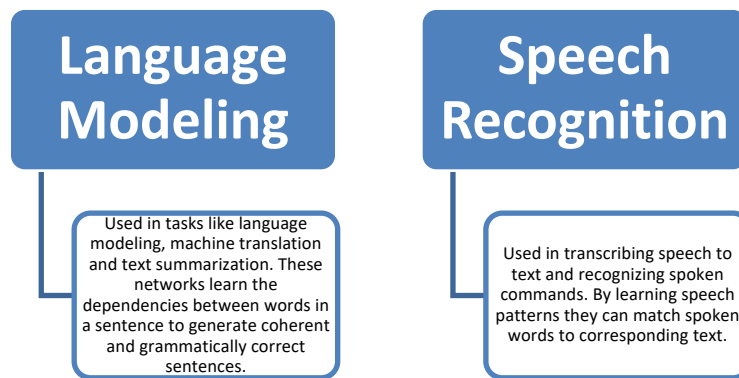


Figure 5. LSTM memory cell, showing the routing mechanisms that enable it to remember and transmit information. Image author: Jürgen Schmidhuber

Speech recognition involves more than recognizing individual sounds in an observed object: strings of sounds must correspond to existing words, and strings of words must make sense in the language. This is called "language modeling". Language models are usually trained on very large chunks of text, often several orders of magnitude larger than the acoustic data. It is easy to find a lot of text, but not so easy to find sources that correspond to naturally spoken sentences.

5. CHAT GPT AS ARTIFICIAL INTELLIGENCE FOR LANGUAGE ANALYSIS

OpenAI has just launched GPT-4, the latest gem in its AI endeavors. More than just a language processor, the GPT-4 is a versatile powerhouse, adept at understanding text, images and sound. Its learning, enriched by massive amounts of data and a transformative architecture, reflects OpenAI's commitment to pushing the boundaries of artificial intelligence.

GPT-4 brings advances in understanding subtle queries, establishing new standards for professional interactions. It adapts to the intricacies of language, providing answers that are seamlessly aligned with high standards of professionalism.

GPT-4 taps into the realms of deep learning, mirroring the human cognitive process. It's not just processing data; it's cultivating deep understanding. The depth of its learning is reflected in the ability to unravel the intricate patterns and nuances within the fabric of language. It builds a reservoir of linguistic patterns by ingesting large amounts of textual data from various sources such as newspaper articles, books, and web pages. This extensive exposure enables GPT-4 to generate text that perfectly matches human expression.

Chat GPT is based on the Transformer architecture, Figure 6, which is trained on a large amount of language data.

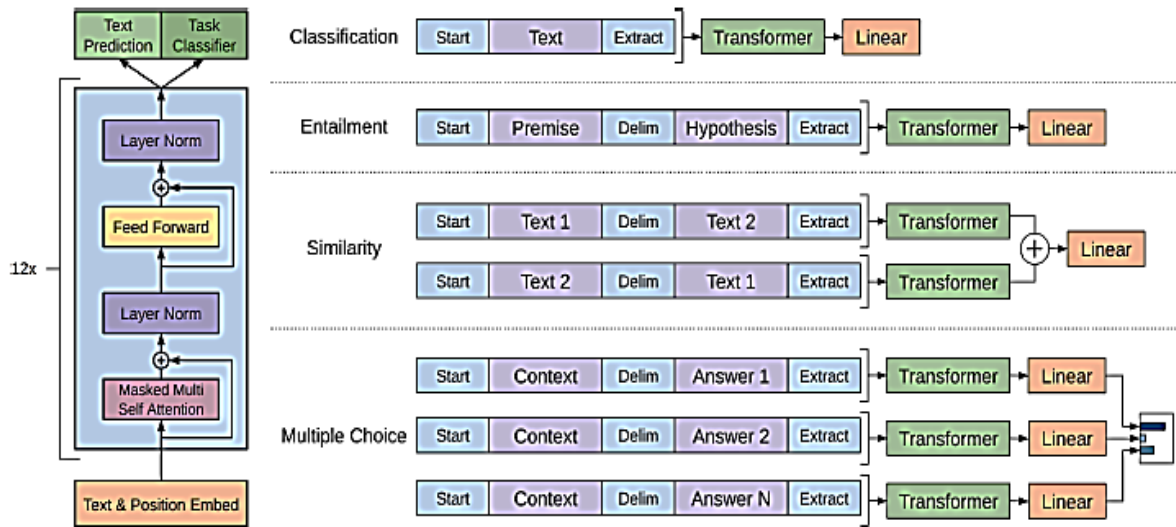


Figure 6. Transformer networks, especially the BERT (Bidirectional Encoder Representations from Transformers) model, had a significant impact on NER. Using a self-attention mechanism that weighs the importance of different words, BERT takes into account the full context of a word by looking at the words that come before and after it. [18]

This model enables the automatic generation of human-like texts and **answers based on entered queries**. It was developed as part of an effort to bring artificial intelligence closer to the human ability to process and understand language. Chat GPT works by analyzing the input text (request) and using deep neural networks to identify patterns and connections in the language. A language model is a type of machine learning model trained to perform probability distributions over words. Simply put, the model tries to predict the next most suitable word to fill the empty space in a sentence or phrase, based on the context of the given text. Language models are used in various NLP tasks, such as speech recognition, machine translation, and text summarization.

Encoder-decoder architecture: In the transformer model, an encoder takes a set of input data (which is usually text) and transforms it into vectors, such as vectors representing the semantics and position of words in a sentence. This continuous representation is often referred to as "embedding" the input string. The decoder receives the encoder outputs and uses them to generate the context and produce the final output.

Attention and self-attention mechanisms: The main component of transformer systems is the *attention mechanism*, which allows the model to focus on certain parts of the input when making predictions. The attention mechanism calculates a weight for each input element, indicating the importance of that element for the current prediction.

In the transformer architecture, the self-care mechanism is applied multiple times in parallel, allowing the model to learn more complex relationships between the input sequence and the output sequence.

In terms of training, transformers are a form of semi-supervised learning. This means that they are first pre-trained using a large set of unlabeled data in an unsupervised way. This pre-training allows the model to learn general patterns and relationships in the data.

After that, the model is fine-tuned through supervised training, that is, it is trained on a smaller labeled data set that is specific to the task at hand. This fine-tuning allows the model to perform a specific task better. They enable:

Content generation: One of the areas where language models shine the most is content generation. This includes generating whole texts or parts of them based on data and concepts provided by people. Content can vary from newspaper articles, press releases and blog posts to product descriptions in an online store, songs and guitar sheet music, etc.

Part of Speech (POS) Labeling: Language models have been widely used to achieve state-of-the-art results in POS labeling tasks. POS labeling is the process of labeling each word in a text with its corresponding part of speech, such as noun, verb, adjective, etc. Models are trained on large amounts of labeled text data and can learn to predict POS words based on its context and surrounding words in a sentence.

Answering questions: Language models can be trained to understand and answer questions with and without given context. They can provide answers in a number of ways, such as extracting specific phrases, paraphrasing the answer, or selecting from a list of options.

Text summarization: Language models can be used to automatically condense documents, papers, podcasts, videos, and more into their most important parts. The models can work in two ways: extract the most important information from the source text or provide summaries that don't repeat the source language.

Sentiment Analysis: The language modeling approach is a good option for sentiment analysis tasks because it can capture the tone of voice and semantic orientation of texts.

It is important that the model does not focus on grammar, but on how words are used in a way that is similar to the way people write. Then, based on these analyses, it generates an answer that is contextually related to the question posed. This ability of the model to understand the context and continuity of the conversation makes it very useful in various situations. The combination of artificial intelligence and natural language represents a revolutionary technological synergy that opens countless opportunities for innovation in various fields. This combined power of technology and language enables the creation of sophisticated systems capable of understanding, processing and generating natural language, opening the door to advancements in various fields. We can use ChatGPT to practice vocabulary since it can provide words and phrases that we can learn. ChatGPT can also help us understand verb conjugations, which can sometimes be difficult to master. ChatGpt, as one of the amazing AI tools, also provides opportunities for syntactic and semantic text analysis. Here is an example from ChatGpt:

MI: Please perform a syntactic and semantic analysis of the text with intentional mistakes and present the statistics of the performed analysis of the introductory part of this paper:

Abstrt: Artificial intelligence (AI) and mahine learning (ML) are wow interrelated concepts that have transformed the way we communicate, learn%\$# and work... All cat applications are based on a common :: set of ideas, relying on algorithms, linguistics, logic, statistics, etc. L(The goal of natural language processing is to provide new computational &%\$ possibilities around human language: for exmple, extrating information from texts, trannnating between languages, answering questions, having a conversation with a computer, receeing instructions, and so on. The paper will show the ways in which it is possible to improve these language skills?

ChatGPT syntactic analysis of the text gives us:

Wrong	Corrected	Wrong	Corrected
"Abstrt:"	"Abstract: ".	"for exmple"	" for example".
"mahine learning:"	" machine learning".	" extration information "	" extracting information "
"wow"	Typo, "two" is needed .	"trannnating"	" translating ".
"cat apps"	" everything " instead of "cat".	"receing instructions"	" receiving instructions".
"joint :: "	A double colon is a mistake.	" hahahaha ."	An informal expression that is not appropriate for academic work.
" logic , statistics, etc."	the last word can be added (e.g. "and other areas"		

Finally, ChatGPT provides us with the corrected text:

Abstract: Artificial intelligence (AI) and machine learning (ML) are two interrelated concepts that have transformed the way we communicate, learn and work. All applications are based on a common set of ideas, relying on algorithms, linguistics, logic, statistics, etc. The goal of natural language processing is to provide new computing capabilities around human language: for example, extracting information from texts, translating between languages, answering questions, having a conversation with a computer, receiving instructions, and so on. The paper will present the ways in which it is possible to improve these language skills.

Semantic analysis

Topics: Artificial Intelligence and Machine Learning: Both concepts are very relevant in modern technology and education.

Natural language processing: A key area that enables interaction between humans and computers.

Improving language skills: The main focus of the work, pointing out the usefulness of AI in language learning.

Clarity: The main idea is clear, but errors in the text can create confusion.

It is necessary to structure sentences better and avoid informal expressions in order to achieve greater professionalism.

Analysis statistics

Word count: 160

Number of sentences: 10

Average sentence length: 16 words

Number of syntax errors: 10

Number of semantic problems: 3 (ambiguities, informality)

Developing new evaluation metrics that are more closely aligned with the goals of specific NLP applications could help to improve the overall performance of GPT and ChatGPT models.

6. CONCLUSION

AI tools for writing are a powerful way to speed up work, but human supervision and editing are key parts of the AI writing process. In the meantime, the main disadvantage of artificial intelligence tools intended for writing is that they sometimes make mistakes. That is why it is important to always check the veracity of the content generated by AI. Using techniques for text classification, we proposed machine learning models and algorithms that use vectorized text and special parameters that can be further optimized. The results we obtained in the research showed that the best results were obtained using a machine learning algorithm, as a form of AI text classifier. Based on the results of the experimental analysis, we can further improve the parameters and work on improving the algorithms in order to obtain an even better analysis model. Although the application of AI in language learning is promising, there are also challenges that need to be overcome. First, many AI tools require access to an Internet connection, which can be limiting for users in areas with weaker infrastructure. Also, there is a risk of over-reliance on technology, which can diminish the development of critical thinking and human interactions necessary for language learning. Another significant challenge is the problem of bias in the data. AI models rely on large data sets for training, and if that data contains biases, the results may be inaccurate or inadequate. For example, AI may have difficulty understanding dialects or specific cultural contexts, which may affect the quality of learning. Looking ahead, AI is expected to continue to play a key role in improving language skills. With the development of new technologies, such as virtual reality (VR) and augmented reality (AR), language learning will become even more interactive and engaging. These technologies can provide realistic scenarios where students can practice the language, simulating conversations with native speakers. Also, research in deep learning and natural language will continue to improve the accuracy and functionality of AI tools, making them even more useful for students. Developing ethical guidelines and approaches that minimize bias will also be key to ensuring that all students have an equal chance to succeed. Artificial intelligence is a powerful tool for improving language skills, enabling personalized, interactive and efficient learning. Although we face challenges, the potential of AI to transform education and facilitate language learning is enormous. As technology advances, we can expect language skills to become more accessible and easier to acquire, creating a world where everyone can communicate and understand language, regardless of barriers.

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DIGITAL TRANSFORMATION AND EMOTIONAL INTELLIGENCE OF LEADERS

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ABSTRACT

In the era of rapid digital transformation, leaders face increasing challenges in managing teams, fostering innovation, and maintaining organizational adaptability. Emotional intelligence (EI) has emerged as a crucial factor in leadership effectiveness, particularly in navigating the complexities of digital change. This paper explores the intersection of digital transformation and EI, emphasizing how emotionally intelligent leaders can facilitate smoother transitions, enhance team collaboration, and mitigate resistance to change. By integrating insights from existing research on leadership, emotional intelligence, and case studies on organizational transformation, this study highlights the role of self-awareness, empathy, and social skills in digital leadership. Findings suggest that leaders with high EI are better equipped to address the psychological and social aspects of digital change, ultimately improving employee engagement and organizational resilience. The paper also discusses strategies for developing EI competencies among leaders to optimize the benefits of digital transformation.

Keywords: digital transformation, SME, leadership

1. INTRODUCTION

The contemporary business environment is characterized by rapid technological advancements that are fundamentally reshaping organizational structures, processes, and workforce dynamics. As industries continue to experience unprecedented changes, organizations must adapt swiftly to remain competitive. Digital transformation is no longer an option but a necessity for businesses seeking to maintain relevance and efficiency in an increasingly digitized world. This transformation extends beyond the mere adoption of new technologies; it represents a profound shift in the way organizations operate, engage with customers, and manage their workforce. At the core of this shift lies the integration of cutting-edge technologies such as artificial intelligence, big data analytics, cloud computing, the Internet of Things (IoT), and automation. These innovations enable businesses to enhance productivity, streamline operations, and deliver improved customer experiences. However, their implementation also demands significant changes in management practices, organizational culture, and leadership approaches. The role of leadership in digital transformation is crucial, as leaders serve as the primary drivers of change within organizations. Their ability to guide employees through uncertainty, inspire innovation, and align technological advancements with strategic objectives determines the success of transformation initiatives. Traditional leadership models, which primarily emphasized technical expertise, authority, and rigid hierarchical structures, are proving insufficient in the face of digital disruptions. Instead, modern leaders must possess a blend of technical proficiency, adaptability, and a deep understanding of human emotions and behaviors. Emotional intelligence has emerged as a key attribute that enables leaders to navigate the complexities of digital transformation effectively. As technology reshapes business landscapes, leaders must recognize that transformation is not solely a technological endeavor—it is fundamentally a human-centric process.

Employees at all levels experience varying degrees of apprehension and resistance when faced with change, particularly when job roles are redefined, processes become automated, and the skill sets required for success evolve rapidly. Managing these emotional and psychological responses is just as critical as deploying the right technological solutions [1]. Digital transformation is not a singular event but an ongoing process that requires continuous adaptation and learning. Organizations that attempt to implement digital initiatives without addressing the human element often encounter resistance, decreased morale, and lower productivity. Leaders with high emotional intelligence are better equipped to manage these challenges by fostering open communication, building trust, and creating an environment where employees feel valued and supported. They recognize that employees are not merely passive recipients of change but active participants whose insights, concerns, and contributions shape the success of transformation efforts. By demonstrating empathy, self-awareness, and strong interpersonal skills, emotionally intelligent leaders help mitigate resistance and drive engagement. This is particularly important as digital transformation often involves uncertainty, requiring employees to embrace new ways of working, acquire new skills, and adapt to evolving organizational structures. When leaders approach transformation with emotional intelligence, they foster a culture of resilience, continuous learning, and collaboration, which are essential for long-term success. Beyond workforce dynamics, digital transformation also impacts decision-making frameworks and business models. The vast amounts of data generated through digital technologies allow organizations to make more informed, data-driven decisions. However, while data provides valuable insights, the ability to interpret and apply these insights effectively requires more than analytical skills—it necessitates emotional intelligence. Leaders must balance data-driven decision-making with human intuition, ethical considerations, and the ability to perceive the broader implications of their choices. For instance, automation and artificial intelligence have the potential to increase efficiency and reduce costs, but their implementation can also lead to job displacement, ethical dilemmas, and concerns about fairness. Emotionally intelligent leaders are more attuned to these complexities and can navigate the social and ethical dimensions of digital transformation with greater sensitivity and foresight. A critical aspect of successful digital leadership is the ability to foster a culture of innovation and psychological safety. Psychological safety, a concept pioneered by organizational psychologist Amy Edmondson, refers to an environment where employees feel safe to express ideas, take risks, and contribute without fear of retribution or criticism. Digital transformation often involves experimentation, rapid iterations, and occasional failures. Organizations that punish failure or discourage open dialogue stifle innovation and hinder progress. Emotionally intelligent leaders recognize the importance of psychological safety and actively cultivate a workplace culture where employees feel empowered to voice concerns, propose creative solutions, and learn from setbacks. This, in turn, accelerates digital adoption and fosters a mindset of continuous improvement [2]. Moreover, digital transformation has changed the nature of leadership itself. With the rise of remote and hybrid work models, leaders are now required to manage teams across geographies, time zones, and digital platforms. Virtual communication presents new challenges in maintaining team cohesion, motivation, and engagement. Leaders with high emotional intelligence are better equipped to bridge the gap created by physical distance, using digital tools effectively while ensuring that employees feel connected and valued. They understand the nuances of digital communication, actively listen to team members, and recognize the importance of non-verbal cues even in virtual interactions. The ability to convey empathy, provide constructive feedback, and maintain strong relationships in a digital-first work environment is becoming an essential leadership competency. Despite the clear benefits of digital transformation, the journey is not without obstacles. Many organizations struggle with legacy systems, resistance from leadership, and the challenge of aligning technological advancements with business objectives.

Furthermore, not all employees possess the digital literacy required to adapt seamlessly to new technologies. In such situations, emotionally intelligent leaders play a crucial role in facilitating training and development programs, offering personalized support, and ensuring that no one is left behind in the transformation process. They recognize that digital transformation is not a one-size-fits-all approach and that different employees require different levels of support, motivation, and guidance. The importance of emotional intelligence in digital transformation becomes even more evident when examining case studies of organizations that have successfully navigated digital shifts. Companies such as Microsoft, under the leadership of Satya Nadella, have demonstrated how emotional intelligence can drive business success. When Nadella took over as CEO, he focused on fostering a culture of empathy, collaboration, and continuous learning, which played a pivotal role in Microsoft's successful transition into a cloud-first, AI-driven company. His leadership style emphasized the importance of understanding employees' perspectives, encouraging a growth mindset, and creating an inclusive work environment where innovation could thrive. Similarly, research on high-performing teams at Google has shown that psychological safety—a key outcome of emotionally intelligent leadership—contributes significantly to team effectiveness, innovation, and adaptability in the digital era. As digital transformation continues to reshape industries, the role of leadership will become increasingly complex, requiring a balance between technological acumen and emotional intelligence. Organizations that prioritize the development of emotionally intelligent leaders will be better positioned to navigate digital disruptions, drive innovation, and create sustainable competitive advantages. While technical skills remain essential, the ability to connect with people, understand their concerns, and inspire them to embrace change is what ultimately determines the success of digital initiatives. The integration of emotional intelligence into leadership development programs is no longer a luxury but a necessity. Organizations must invest in training initiatives that equip leaders with the emotional competencies needed to manage digital transformation effectively. By fostering a culture of empathy, collaboration, and adaptability, leaders can ensure that digital transformation is not only about adopting new technologies but also about creating a resilient, engaged, and forward-thinking workforce. As businesses continue to navigate the complexities of the digital age, the ability to lead with emotional intelligence will be a defining factor in achieving long-term success [3].

2. LITERATURE REVIEW

2.1 The Role of Emotional Intelligence in Leadership

Emotional intelligence, as conceptualized by Daniel Goleman (1995), encompasses five core components:

- Self-Awareness – Understanding one's own emotions, strengths, and limitations [4];
- Self-Regulation – Managing disruptive emotions and maintaining composure in challenging situations [5];
- Motivation – Demonstrating resilience, optimism, and a strong drive to achieve organizational goals [6];
- Empathy – Recognizing and understanding the emotions and perspectives of others [7];
- Social Skills – Building and maintaining positive relationships, fostering collaboration, and effectively communicating [8].

These competencies are particularly relevant in digital transformation, where leaders must inspire trust, alleviate employee concerns, and create a supportive environment for change. Leaders with high EI are better equipped to address resistance, provide reassurance, and align teams with new strategic directions.

2.2 Digital Leadership and Emotional Intelligence

Digital leaders must possess a unique combination of technical proficiency and emotional intelligence to drive transformation successfully. Unlike traditional leadership, digital leadership requires adaptability, continuous learning, and the ability to navigate ambiguity. The dynamic nature of digital transformation demands that leaders adopt an agile mindset, where rapid decision-making and resilience are essential. A key aspect of emotional intelligence in digital leadership is the ability to foster psychological safety within teams. Psychological safety, as defined by Edmondson (1999), refers to an environment where employees feel safe to express ideas, take risks, and innovate without fear of negative consequences. Digital transformation often involves experimentation, iteration, and occasional failure. Leaders with high EI create a culture that encourages learning from failures, rather than penalizing mistakes, ultimately fostering an innovation-driven mindset. Additionally, digital transformation often results in the need for remote or hybrid work models. Emotionally intelligent leaders are more effective in managing virtual teams, ensuring team cohesion, and addressing the challenges of digital communication. They understand the importance of non-verbal cues, active listening, and empathy in digital interactions, which helps maintain a strong team dynamic despite physical distance.

Challenges of Digital Transformation and the Need for Emotionally Intelligent Leaders

Despite its numerous advantages, digital transformation presents significant challenges, including:

- **Technological Disruptions:** The continuous evolution of technology requires leaders to stay updated and agile in decision-making [9];
- **Employee Resistance:** Fear of job displacement, skill obsolescence, and increased workload can create resistance among employees [10];
- **Cultural Shifts:** Organizations must transition from hierarchical structures to more agile and flexible models, requiring a cultural shift in leadership and management practices [11];
- **Ethical Considerations:** The use of AI, data analytics, and automation raises concerns about privacy, fairness, and job security [12];

Emotionally intelligent leaders play a crucial role in addressing these challenges. By leveraging self-awareness and empathy, they can identify sources of resistance, provide appropriate support, and create a vision that aligns with employee concerns and aspirations. Effective communication and relationship management are also critical in ensuring that employees feel valued and engaged in the transformation process.

2.3 Case Studies on Emotional Intelligence in Digital Leadership

Several case studies highlight the significance of emotional intelligence in successful digital transformation initiatives. For example, leading technology firms such as Microsoft and Google have integrated EI-based leadership development programs to enhance their transformation strategies.

Microsoft's Transformation Under Satya Nadella

When Satya Nadella took over as CEO of Microsoft, he emphasized a leadership culture grounded in emotional intelligence. By fostering a growth mindset, promoting empathy, and encouraging open communication, Nadella successfully led Microsoft's transition into a cloud-first, AI-driven company. His leadership approach demonstrated how EI enhances organizational resilience and innovation in the face of technological disruption.

Google's Psychological Safety Framework

Google's Project Aristotle, a study on effective team dynamics, found that psychological safety—an EI-driven leadership trait—was the most critical factor in high-performing teams. Leaders who fostered psychological safety enabled employees to adapt more effectively to digital transformation by creating a culture of trust and collaboration. Given the importance of EI in digital transformation, organizations should prioritize leadership development initiatives that focus on emotional intelligence. Some key strategies include:

- **EI Training Programs:** Organizations should invest in workshops and coaching sessions that enhance self-awareness, empathy, and interpersonal skills.
- **Mindfulness and Resilience Training:** Encouraging leaders to practice mindfulness helps them manage stress, maintain focus, and make emotionally balanced decisions.
- **Feedback Mechanisms:** Implementing 360-degree feedback systems allows leaders to gain insights into their emotional intelligence strengths and areas for improvement.
- **Inclusive Leadership Approaches:** Emotionally intelligent leaders should foster diversity, equity, and inclusion by recognizing and valuing different perspectives within digital teams [13, 14].

3. DISCUSSION OF RESEARCH RESULTS

The interplay between digital transformation and emotional intelligence in leadership presents a complex yet crucial area of study in modern organizational management. Digital transformation, driven by advanced technologies such as artificial intelligence, big data analytics, and automation, is fundamentally altering the way businesses operate. However, successful digital transformation extends beyond the mere implementation of technology; it requires a leadership approach that integrates emotional intelligence to manage the human side of change. The discussion surrounding this topic highlights the evolving demands placed on leaders and the necessity of balancing technical expertise with interpersonal skills to navigate the challenges of digitalization effectively.

One of the primary challenges organizations face in digital transformation is resistance to change. Employees often fear job displacement, struggle with learning new technologies, or feel overwhelmed by the pace of transformation. Traditional leadership models that rely solely on authority and directive management approaches may prove ineffective in addressing these concerns. Instead, emotionally intelligent leaders, who possess self-awareness, empathy, and social skills, are better equipped to ease employees through the transition. They recognize that digital transformation is not just about technology but about people and culture, requiring a leadership approach that fosters trust, collaboration, and open communication [15]. Figure 1 displays recognized key parameters of influence of digital transformation on emotional intelligence of leaders.

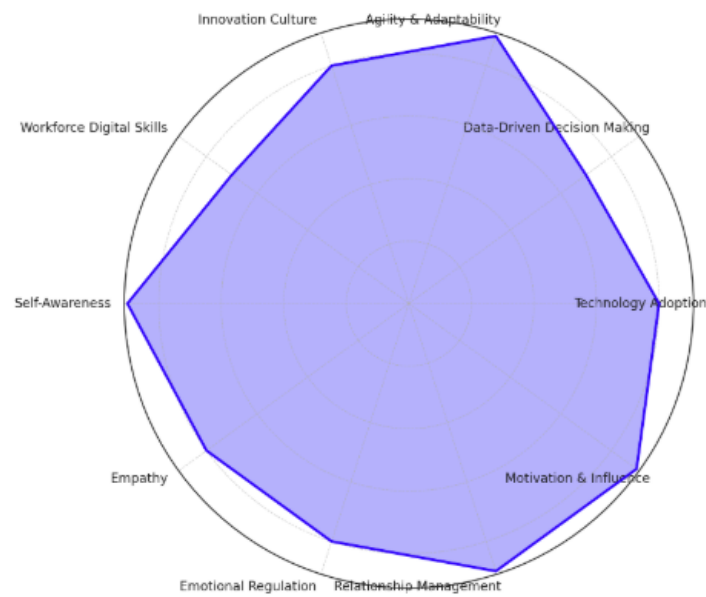


Figure 1. Key parameters of influence of digital transformation on emotional intelligence of leaders

Empathy, a core component of emotional intelligence, plays a pivotal role in mitigating resistance to digital transformation. Leaders who take the time to understand employee concerns and provide personalized support can significantly improve workforce morale and engagement. By actively listening and addressing fears associated with technological changes, leaders can reduce anxiety and encourage employees to view digital transformation as an opportunity rather than a threat. Furthermore, such leaders cultivate an environment where employees feel valued and motivated to adapt, which in turn enhances productivity and innovation. Another critical factor in this discussion is the role of emotional intelligence in fostering an innovative and agile organizational culture. The digital era requires organizations to be highly adaptable, encouraging experimentation and risk-taking. However, employees are less likely to embrace innovation in environments where failure is punished or where they feel emotionally disconnected from leadership. Emotionally intelligent leaders create psychological safety—an environment where employees feel confident expressing ideas, questioning existing processes, and learning from failures without fear of negative consequences. This fosters a culture of continuous learning, which is essential for successful digital transformation [16].

Additionally, digital transformation has redefined traditional workplace structures, with remote and hybrid work models becoming more prevalent. Leaders must now navigate the complexities of managing distributed teams, ensuring engagement and collaboration despite geographical distances. Emotional intelligence is critical in maintaining team cohesion, as it allows leaders to build strong interpersonal relationships even in virtual settings. Leaders who demonstrate empathy and effective communication can keep remote employees motivated and aligned with organizational goals, ensuring that digital transformation does not lead to disconnection or disengagement. In conclusion, digital transformation is not solely a technological shift but a human-centric one, where leadership plays a decisive role in shaping outcomes. Emotional intelligence serves as a vital tool for leaders to manage resistance, foster innovation, and maintain employee engagement in a rapidly evolving digital landscape. As businesses continue to integrate technology, leaders who prioritize emotional intelligence will be better positioned to drive sustainable transformation, ensuring that both technological advancements and human potential are leveraged effectively for long-term success [17, 18].

4. CONCLUSION

In an era marked by rapid technological advancements and an ever-evolving digital landscape, the intersection of digital transformation and emotional intelligence in leadership has emerged as a critical factor for organizational success. Digital transformation is not merely a technological upgrade; it represents a fundamental shift in how businesses operate, interact with stakeholders, and manage their workforce. As organizations integrate artificial intelligence, big data analytics, cloud computing, and automation into their operational frameworks, the role of leadership extends beyond technical expertise to include the management of human emotions, workforce adaptation, and organizational culture. This is where emotional intelligence becomes a defining attribute of effective leadership. At its core, emotional intelligence enables leaders to navigate the complexities of digital transformation by fostering a culture of trust, collaboration, and innovation. Leaders who possess high emotional intelligence are better equipped to manage resistance to change, address employee concerns, and maintain engagement in the face of uncertainty. The transition to a digital-first organization often triggers fear and anxiety among employees, as automation and technological shifts alter traditional job roles and require continuous upskilling. Leaders with strong emotional intelligence recognize these challenges and proactively create an inclusive environment where employees feel supported and valued [19]. One of the most significant barriers to digital transformation is resistance to change. Employees often resist technological advancements due to concerns about job security, lack of digital literacy, or discomfort with new systems and workflows. Leaders with emotional intelligence can mitigate these concerns by demonstrating empathy, providing clear communication, and fostering a growth mindset within their teams. Instead of imposing change from the top down, emotionally intelligent leaders involve employees in the transformation process, encouraging feedback, collaboration, and shared ownership of new initiatives. This participatory approach reduces resistance and enhances the likelihood of successful technology adoption. Beyond managing resistance, emotional intelligence is crucial for fostering an innovation-driven culture. Digital transformation requires organizations to experiment with new ideas, take risks, and embrace continuous learning. However, innovation can only thrive in an environment where employees feel psychologically safe to voice their opinions, challenge existing processes, and contribute creative solutions without fear of failure or criticism. Emotionally intelligent leaders cultivate this sense of psychological safety by promoting open dialogue, recognizing employees' contributions, and supporting their professional development. By valuing human capital as much as technological assets, these leaders position their organizations for long-term success in the digital economy. The evolving nature of leadership in a digital-first world also requires a shift in traditional management approaches. Remote and hybrid work models, facilitated by digital tools and platforms, have changed how teams communicate, collaborate, and maintain productivity. Leaders must navigate the complexities of virtual work environments, where the absence of face-to-face interactions can lead to disengagement, miscommunication, and diminished team cohesion. Emotionally intelligent leaders bridge this gap by leveraging digital communication tools effectively, fostering a strong sense of connection, and ensuring that employees remain engaged and motivated despite physical distance [20]. Moreover, emotional intelligence plays a pivotal role in ethical decision-making in the digital age. With the rise of automation, AI-driven decision-making, and data analytics, organizations must balance efficiency with ethical considerations. Decisions regarding workforce automation, data privacy, and algorithmic bias require leaders to approach technological implementation with emotional intelligence, ensuring that digital transformation aligns with ethical business practices and human-centered values. Emotionally intelligent leaders recognize the broader societal implications of digital transformation and strive to make decisions that are both technologically sound and ethically responsible.

Case studies of successful organizations further highlight the impact of emotionally intelligent leadership on digital transformation. Companies such as Microsoft, under the leadership of Satya Nadella, have demonstrated how fostering a culture of empathy, collaboration, and continuous learning can drive successful digital transformation. By prioritizing employee engagement and creating a workplace environment that encourages adaptability and innovation, Microsoft was able to transition into a cloud-first, AI-driven company while maintaining a highly engaged workforce. Similarly, research on high-performing teams has shown that organizations that emphasize psychological safety and emotional intelligence experience higher levels of innovation, productivity, and adaptability. As digital transformation continues to reshape industries, organizations must recognize that technology alone is not a solution; it is a tool that must be effectively integrated into the human-centric aspects of business operations. Leaders who fail to consider the emotional and psychological dimensions of transformation risk alienating employees, slowing adoption rates, and encountering implementation failures. On the other hand, leaders who leverage emotional intelligence can navigate these challenges successfully, ensuring that digital transformation efforts lead to sustainable growth and long-term competitive advantage. To prepare for the future, organizations must invest in leadership development programs that prioritize emotional intelligence. Training initiatives that enhance leaders' abilities to manage emotions, communicate effectively, and foster inclusive work environments will be crucial for navigating digital disruptions. Additionally, organizations should establish support systems that help employees develop digital competencies while addressing their concerns and fears related to technological change. In conclusion, the success of digital transformation is not determined solely by technological advancements but by the ability of leaders to manage change, inspire innovation, and support their workforce through the transition. Emotional intelligence serves as the bridge between digital strategy and human adaptation, ensuring that transformation is both technologically efficient and emotionally sustainable. As businesses continue to evolve in the digital era, the leaders who prioritize empathy, self-awareness, and interpersonal skills will be the ones who drive meaningful change, create resilient organizations, and pave the way for a future where technology and human potential coexist harmoniously.

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DERIVATIVE LAWSUIT AS A MEAN OF PROTECTING THE INTERESTS OF COMPANIES WITH STATE CAPITAL

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ABSTRACT

Due to the turbulent business environment, which changes the way of functioning and acting on a daily basis, the circumstances and conditions in which business entities face various business challenges, the legal protection of the interests of a company must be at an enviable level. That is why the author has decided to designate the derivative lawsuit and its application in the law of the Republic of Serbia as the main term in the paper. A derivative lawsuit is a type of lawsuit filed by members, in their name, on behalf of the company and it is basically a corrective mechanism of company law that serves to protect the property interests of the company in circumstances where the interests of the company are violated by persons who should protect them in the first place. It is a very complex institute of corporate law for which practice has shown that it needs to be improved. A derivative lawsuit in the public sector works similarly to the private sector, but with some specifics. The aim of this paper is to highlight the fact that in the public sector, a derivative action may be initiated by members of a company or organization against persons responsible for the management or control of public resources, when those persons are not acting in the best interests of the company or organization. In the Republic of Serbia, a derivative lawsuit is regulated by the Companies Act and we believe that this has been done in a very correct way, but that it is possible to improve the existing regulations in order to increase its efficiency and harmonize the existing regulations of the Republic of Serbia with the regulations of developed countries in the region. This type of lawsuit allows members of the company to file a lawsuit in their own name, but on behalf of the company, against persons who have breached their legal obligations to the company. In the public sector, a derivative action can be used as a tool to protect public interests and ensure the accountability of those who manage public resources. For example, members of a public organization may bring a derivative action against a board of directors or directors who have abused their authority or acted in a manner detrimental to the interests of the organization. Due to the above, and by applying almost all the basic methods of knowledge and research, as well as general scientific methods, and especially the method of analyzing the content of documents, laws and with the application of the historical-comparative method, we conclude the paper with recommendations and suggestions to change the legal definition of derivative lawsuit in the near future, with the aim of raising awareness of business practice about the importance of derivative lawsuit as an institute of company law.

The particular value of this article is the disclosure of perspectives related to the derivative lawsuit and its application in the public sector.

Keywords: *derivative lawsuit, company, private sector, public sector*

1. INTRODUCTION

A derivative lawsuit is a legal remedy that allows shareholders or members of a company to file a lawsuit on behalf of and for the benefit of that company. It is one of the most complex institutes in corporate law. In the case of a derivative lawsuit, the decision to initiate legal proceedings is made by individual members of the company, and the course and management of the proceedings, regarding a significant range of issues, are also in the hands of the individual members of the company who filed the lawsuit. The decision to file a derivative lawsuit can also be made unanimously by all members of the company, or by a majority of the members, but a key feature of the derivative lawsuit is that the decision to file a lawsuit can be made by members who represent a minority in the company (most often members who meet the legally prescribed capital threshold). Considering that Serbian corporate law regulates four legal forms of business entities, it should be noted that in this paper the terms "member of a business entity" and "business entity" will be used only in the context of capital companies (limited liability companies and joint-stock companies), but not in the context of partnerships (partnership and limited partnership). In this sense, the forthcoming analysis will primarily focus on capital companies.

2. LEGAL NATURE, DEFINITION AND PURPOSE OF DERIVATIVE ACTION

The derivative lawsuit is a complex legal institute, which is why it is difficult to formulate its precise definition that would encompass all the specificities of this institute. In this regard, it is not surprising that the majority of theorists do not pay much attention to the concept of derivative lawsuits, and they usually only provide rough definitions of the derivative lawsuit in relation to the provisions of specific laws. Starting from the divisions of the definitions of derivative lawsuits (general and special, positive and negative), as well as other definitions that may be encountered in theory, all definitions of derivative lawsuits can be divided into two groups¹. The first group defines derivative action primarily from a procedural perspective. Thus, for example, a derivative suit is defined as "a lawsuit filed by one or more shareholders to prevent or remedy damage caused to the company" or as "a lawsuit by a member of the company on behalf of the company to protect its rights that have been violated by the breach of specific duties by the directors" or simply as "a lawsuit filed on behalf of the company"². These definitions hint at the material legal substrate of a derivative action, but do not entirely define it, which is not the correct approach, since the material legal substrate of the action should represent an important element of the definition of a derivative action, given that a derivative action is not a general action of corporate law. The second group of definitions of derivative lawsuits, besides explaining the procedural aspect of the lawsuit (in whose name and for whose account the lawsuit is filed), also contains a functional element, emphasizing that it is a lawsuit aimed at ensuring that the violation of duties toward society does not go without adequate sanction. Thus, the emphasis is placed on the fact that it is a lawsuit applied in specific circumstances, namely when there is a sort of confusion between the plaintiff and the defendant, that is, when a person who should normally file the lawsuit on behalf of the company will not do so, precisely because that person should be in the position of the defendant.

¹ Savković Vladimir., (2004)., *Derivativne akcionarske tužbe*, magistrski rad, Pravni fakultet Univerziteta u Beogradu., str. 14 - 18.

² Dan W. Puchniak., Harald Baum., Michael Ewing-Chow., (2012)., *The Derivative Action in Asia: A Comparative and Functional Approach*, Cambridge University Press., str. 7.

However, even with this group, the definition of the material legal substrate of the derivative lawsuit is not sufficiently emphasized. Considering this, a comprehensive and complete definition of the derivative lawsuit should encompass all three mentioned elements: procedural, material, and functional aspects. Starting from the presented legislative framework of derivative action in Serbian law, a derivative action can be defined as a lawsuit filed by one or more members of a society who meet the legally prescribed conditions, in their own name, but for the account of the company, against:

- individuals who have special obligations towards the society, for the purpose of enforcing legally prescribed property legal sanctions due to violation of special obligations,
- shareholders for the reimbursement of a financial amount that was paid to that member contrary to the rules regarding payment restrictions, or
- a member of a limited liability company for exclusion from the company.

On the other hand, determining the legal nature of a derivative lawsuit is a significantly more difficult task than determining the definition of a derivative lawsuit. Determining the legal nature of a derivative lawsuit should answer the question of what, from a legal perspective, the authorization of a company member to file a derivative lawsuit represents, a question that is not easy to answer, as it is necessary to consider the general teachings about the concept of subjective rights, which is not commonly addressed in the theory of corporate law, which generally does not venture into such analyses. At the same time, analyzing the legal nature of a derivative lawsuit from the perspective of the general teachings on subjective rights may also seem unnecessary. The issue of the legal nature of derivative lawsuits in our theory has been addressed only by Prof. Vladimir Savković, who believes that the derivative lawsuit, by its legal nature, is close to the concept of natural law³.

American and English literature has also not addressed the issue of the legal nature of derivative lawsuits, which is understandable, as it mainly deals with issues of practical significance. A derivative lawsuit, as the name of the institute suggests, is a lawsuit, and in that sense, like any other lawsuit, it undoubtedly represents a litigation action that initiates litigation proceedings and requests legal protection of a certain content from the court⁴. However, the legal nature of a derivative action cannot be reduced solely to the concept of litigation, as the filing of a lawsuit is preceded by the existence of a specific legal relationship between the plaintiff and the company whose rights are being protected, which constitutes the basis for the member's authority to file a derivative action. In this regard, it is necessary to define the legal nature of the very authority to file a derivative action, until the moment when the authority materializes in the form of undertaken litigation. Considering the above, the first question that can be posed when determining the legal nature of a derivative lawsuit is whether the authorization to file a derivative lawsuit has the legal nature of a subjective right. In general theory of civil law, the term subjective right refers to a material legal entitlement accompanied by an obligation of other parties⁵. Thus, the two key elements of civil subjective rights are authority and obligation, which are functionally connected elements. However, theory holds that every right must be accompanied by an obligation, whereas the reverse is not always the case, because there are obligations in civil law that are not accompanied by the right of another subject.⁶

³ Savković Vladimir., (2004)., Derivativne akcionarske tužbe, magistarski rad, Pravni fakultet Univerziteta u Beogradu., str. 38 - 40.

⁴ Poznić Borivoje., Rakić Vodinelić Vesna., (2015)., Građansko procesno pravo, Pravni fakultet Univerziteta Union i Službeni glasnik, Beograd., str. 294.

⁵ Rakić Vodinelić Vesna., (2011)., Zakon o parničnom postupku 2011., Pravni zapisi 2/2011., str. 192.

⁶ Rakić Vodinelić Vesna., (2011)., Zakon o parničnom postupku 2011., Pravni zapisi 2/2011., str. 192 – 194.

In this regard, if the prevailing opinion were accepted, a derivative action could be qualified as a subjective right of a company member only if the member's right to demand the initiation of proceedings by the company before filing a lawsuit could be considered a sort of material legal authority, accompanied by an obligation of another party; however, it is undisputed that this is not the case. Namely, a derivative action does not represent a material legal authority, because if the company does not initiate legal proceedings (at the prior request of a company member), the sanction that follows is not the possibility of enforced realization of rights, but the possibility of its direct exercise, which would otherwise be impermissible. Thus, in this case, the non-exercise of "material legal authority" is factually the basic condition for its existence. In addition to the above, the "right" to file a lawsuit is not correlated with the specific obligation of any other person within the company, including the company itself. Eventually, it could be considered that the authority of a member of the company to file a derivative lawsuit corresponds to the obligation of all other persons within the company, as well as the company itself, to endure the filing of the lawsuit. However, in this case, it is only a semblance of obligation, since the filing of a derivative lawsuit cannot be prevented by other entities within the company, and thus, by the nature of things, there cannot be an obligation to endure.

The obligation to endure can only exist if it is possible to take a certain action, but which is in this specific case prohibited due to the existence of the rights of another person. The filing of a derivative lawsuit can only be prevented by filing a direct lawsuit by the company, but if that happens, the authority of a member of the company to file a derivative lawsuit will not arise either, as the authority to file a derivative lawsuit only comes into existence at the moment when all legally prescribed conditions are met, and one of those conditions is that the company has not filed a direct lawsuit. One of the problems that exist in defining the legal nature of a derivative lawsuit is caused by the fact that general legal theory (including civil law) hardly takes into account that the authorization to file a lawsuit can also belong to a person who is not the holder of the material right that is being protected. General theory understands the right to file a lawsuit as an authorization that arises from a subjective right, and thus there is no need for a special definition of the legal nature of the authorization to file a lawsuit. However, when the authorization to file a lawsuit represents the only right that a particular person has, serious difficulties arise in defining the legal nature of that authorization, which is not related to the subjective right of that same person. Modern civil law literature does not consider the right to file a lawsuit as an independent right, or an element of subjective rights, but rather as a manner of exercising a right (it is said that a lawsuit is the result of a right exercised) or as a characteristic of subjective rights, which does not affect the existence of the right, since there are rights that do not enjoy protection⁷.

However, in older literature, the right to file a lawsuit was considered an integral element of subjective civil rights, which can even exist independently of the subjective right⁸. Based on the above, it can be concluded that a derivative lawsuit does not have the nature of a subjective right, but rather an authorization that is similar to a subjective right and is part of its legal position as a member of the society. In the final outcome, it can be concluded that a derivative lawsuit has a mixed legal nature, as in the phase before filing the lawsuit with the court, it contains elements of legal status, that is, the legal position of a member of the society, while from the moment of filing the lawsuit it represents a litigation act.

⁷ Stojanović Dragoljub., Antić Oliver., (2004)., Uvod u građansko pravo, Pravni fakultet Univerziteta u Beogradu., str. 195.

⁸ Gams Andrija., (1978)., Uvod u građansko pravo, opšti deo, Naučna knjiga, Beograd., str. 86.

2.1. Characteristics of derivative lawsuit

Derivative action is not a general action of corporate law, but is limited both by subjective and objective domains of application. In addition to the above, the following characteristics of the derivative action are highlighted in theory⁹:

- the right that is protected by a lawsuit belongs to the company, not the plaintiff,
- the violation of the company's rights was caused by a person who has certain duties/obligations to the company,
- the person/entity that should regularly file a lawsuit to protect the company's rights has not done so, mainly because they would need to be in the position of the defendant,
- the right to file a lawsuit has been delegated to a third party, generally a member of the company, who in regular circumstances does not have the authority to protect the company's rights through a lawsuit,
- the compensation obtained in the proceedings belongs to the company, not to the plaintiff, but the costs of the proceedings, at least initially, are borne by the plaintiff.

All the aforementioned characteristics of derivative lawsuits also exist in Serbian law. The fourth characteristic of a derivative lawsuit indicates two very important features of a derivative lawsuit, namely the separation of substantive and procedural legitimacy on the part of the plaintiff, as well as the fact that a derivative lawsuit represents an exception to the regular distribution of authority to make decisions on behalf of the company. In this regard, the derivative lawsuit in Serbian law, as well as in other legal systems, represents a form of representative lawsuit, as in the proceedings the plaintiffs represent the interests of the corporation, but indirectly also the interests of all members of the company. In addition to the above, it is considered that a derivative lawsuit usually has one more important characteristic, which is that it represents the only legal mechanism for compensation of reflective damages caused to the members of the company by the breach of duties towards the company. Namely, in this case, it is about damage that occurs to the property of the members of the company due to the damage suffered by the company. Anglo-Saxon law recognizes the principle of prohibition of compensation for reflective damage in the form of individual lawsuits, based on which it is concluded that reflective damage can only be compensated through derivative lawsuits¹⁰. In conclusion, it is important to emphasize that in comparative law, there is another characteristic of derivative lawsuits, which is the emphasized role of the court in the proceeding for a derivative lawsuit. Namely, based on the outlined legislative framework for derivative lawsuits in Germany and England, it can be concluded that in these jurisdictions, the court in the proceedings for a derivative lawsuit not only decides on the validity of the derivative lawsuit but also on the appropriateness of the lawsuit, considering that the court can prevent the continuation of the proceedings for a derivative lawsuit if it determines that the lawsuit, among other things, is not in the interest of the company. In Serbian law, the court does not have the jurisdiction to decide on the appropriateness, but only on the validity of the claim.

2.2. Modern understanding of derivative lawsuit

With the change in the understanding of the purpose of a corporate entity and the interests that exist within society, there has been a change in the understanding of derivative lawsuits, and consequently, the purpose that a derivative lawsuit should fulfill in corporate law.

⁹ Dan W. Puchniak., Harald Baum., Michael Ewing-Chow., (2012)., *The Derivative Action in Asia: A Comparative and Functional Approach*, Cambridge University Press., str. 7.

¹⁰ Dan W. Puchniak., Harald Baum., Michael Ewing-Chow., (2012)., *The Derivative Action in Asia: A Comparative and Functional Approach*, Cambridge University Press., str. 10.

This change occurred at the beginning or likely in the middle of the 20th century¹¹, when the first public companies emerged, which have a large number of members, but also a large number of employees, creditors, as well as holders of other interests within society. Changes in the understanding of derivative action first arose when derivative action was classified as an instrument for protecting minorities in society. Besides in theory, the qualification of derivative action as the right of minority members of society was also present during the drafting of the UK Companies Act of 2006. The understanding of derivative lawsuits in the context of protecting minority members of society represents a departure from the traditional understanding of derivative lawsuits, which viewed derivative lawsuits as an instrument with limited applicability and as an exception to general rules. In this regard, understanding derivative lawsuits as an instrument for the protection of minority members of society actually marks a shift in the understanding of derivative lawsuits, as in this case, derivative lawsuits are perceived proactively, not merely as a means to address issues in expressing the will of the corporation. In other words, the qualification of derivative lawsuits as a right of minority members of society should allow for the application of the lawsuit in circumstances when minority members feel their interests are threatened; however, this understanding of derivative lawsuits is quite controversial, which will be discussed in the presentation regarding the role of derivative lawsuits in corporate law. The understanding of derivative lawsuits in the context of protecting minority members of society represents a departure from the traditional understanding of derivative lawsuits, which viewed derivative lawsuits as an instrument with limited applicability and as an exception to general rules. In this regard, understanding derivative lawsuits as an instrument for the protection of minority members of society actually marks a shift in the understanding of derivative lawsuits, as in this case, derivative lawsuits are perceived proactively, not merely as a means to address issues in expressing the will of the corporation. In other words, the qualification of derivative lawsuits as a right of minority members of society should allow for the application of the lawsuit in circumstances when minority members feel their interests are threatened; however, this understanding of derivative lawsuits is quite controversial, which will be discussed in the presentation regarding the role of derivative lawsuits in corporate law¹². The concept of corporate governance and agency issues will be specifically addressed in Chapter IX, so it is enough to just emphasize at this point that the idea of corporate governance and agency problems is based on the existence of multiple different interests within a business¹³. Therefore, unlike the period at the beginning of the 20th century and earlier, when the interests of society's members were primarily recognized and equated with the interests of the business society, in modern corporate law it is undeniable that the business society consists of many more interests. This circumstance leads to the possibility that the interests existing in society can be in conflict with each other, hence the need for mechanisms that can prevent the emergence of conflicts. One of the mechanisms that can serve this purpose is a derivative action, but the dilemma that exists today is to what extent is a derivative lawsuit an effective mechanism of corporate governance, as there are completely opposing views on this topic¹⁴.

¹¹ Ann M. Scarlett., (2013)., Shareholder Derivative Litigation's Historical and Normative Foundations, Buffalo Law Review, Vol. 61., str. 840.

¹² Stephen P. Ferris., Robert M. Lawless., Anil K. Makhija., (2001)., Derivative Lawsuits as a Corporate Governance Mechanism: Empirical Evidence on Board Changes Surrounding Filings, CORI, Working Paper No. 01-03., str. 2.

¹³ John Armour., Henry Hansmann., Reinier Kraakman., (2009)., Agency Problems, Legal Strategies, and Enforcement, European Corporate Governance Institute, Law Working Paper No. 135/2009., str. 3.

¹⁴ Stephen P. Ferris., Robert M. Lawless., Anil K. Makhija., (2001)., Derivative Lawsuits as a Corporate Governance Mechanism: Empirical Evidence on Board Changes Surrounding Filings, CORI, Working Paper No. 01-03., str. 3.

The fact that the derivative lawsuit is today understood as a mechanism of corporate governance also confirms that the understanding of the purpose of the derivative lawsuit has changed. Namely, an efficient mechanism of corporate governance should act preventively, meaning that the mere possibility of applying the mechanism prevents the emergence of conflicts. In this regard, the derivative lawsuit, in addition to its existing repressive purpose, has acquired a new purpose, which is to influence the behavior of those individuals who may be sued in a derivative action, while not losing its original purpose, which is to eliminate the consequences of breaches of duty to the company. The dilemma that exists today is which purpose of the derivative lawsuit is primary, or more accurately, whether the preventive function of the derivative lawsuit, as an addition, has become more significant than the traditional purpose of the derivative lawsuit, which will always exist, regardless of the additional purposes of the derivative lawsuit. Despite the change in understanding, the derivative lawsuit has retained the basis of its traditional interpretation, which is based on the principle of subsidiarity and that unlimited application of the derivative lawsuit is not desirable. However, it seems that the modern understanding of the derivative lawsuit tends toward a greater degree of application of the derivative lawsuit, as the conditions for filing a lawsuit are structured in a way that encourages members of the company to file a lawsuit, while still limiting its application in a certain form to prevent the filing of unfounded lawsuits (an example of this is English law)¹⁵. This led to the expansion of the application of derivative lawsuits with respect to the breach of the duty of care, as well as the elimination of some of the traditional exceptions under which it was only possible to file a lawsuit. However, new solutions have been formed that should achieve a balance between the new function of derivative lawsuits and preventing their abuse. Unlike English law, in American law the duty of care has been included in the domain of derivative lawsuits, but it was only in 1985 that the first case was recorded in which directors were held responsible for breaching the duty of care¹⁶.

However, at the same time, modern understanding has somewhat contributed to the narrowing of the application of derivative lawsuits, as an additional condition for assessing the admissibility of the lawsuit has been established, namely that the lawsuit must be in the interest of society in each specific case, which is not equated with the merits of the claim. In this regard, it can be said that the interest of society, as a prerequisite for the admissibility of derivative lawsuits, is today the most significant yet most contentious segment of the regulation of derivative lawsuits. Nevertheless, it should be noted that not all positive laws require that derivative lawsuits be in the interest of society, including Serbian law. In conclusion, it can be said that the most significant novelty that has come with the modern understanding of derivative lawsuits is that the interest of society is placed at the center, as the majority of laws stipulate that a derivative lawsuit is inadmissible unless it is in the interest of society. Thus, unlike the traditional understanding when the derivative lawsuit was viewed exclusively in the context of the company's ability to express its will regarding a specific dispute, the modern understanding of the derivative lawsuit has elevated the traditional view to a higher level. The consideration of whether the company is unjustly prevented from filing a lawsuit is only one of the elements evaluated when determining the ultimate goal, which is whether the derivative lawsuit is in the interest of the company. Additionally, the concept of the interest of the business entity is not necessarily equal to the interest of its members, as is the case in the traditional understanding of the derivative lawsuit.

¹⁵ Arad Reisberg., (2007)., *Derivative actions and corporate governance*, Oxford University Press., str. 127.

¹⁶ Lawrence A. Hamermesh., *Twenty Years After Smith v. Van Gorkom.*, (2006). *An Essay on the Limits of Civil Liability of Corporate Directors and the Role of Shareholder Inspection Rights*, Washburn Law Journal, Vol. 45., str. 283.

2.3.Purpose of the derivative lawsuit

The theory holds that a derivative action can serve two purposes, namely compensation for damages and a preventive impact on the behavior of individuals who may be sued in a derivative action¹⁷. Thus, the professor Arad Reisberg believes that a derivative lawsuit can serve both the function of enforcing specific obligations to the company and what is known as an interpretative function. The interpretative function of the derivative lawsuit implies that it aids in the interpretation of legal standards that define specific obligations to the business entity, or in other words, the derivative lawsuit helps to set boundaries between permissible and impermissible behavior¹⁸. When it comes to the forced execution of special duties towards a business entity, this function fundamentally represents a concretization of the repressive function of the derivative lawsuit, as the emphasis is placed on the content of the norms that are enforced. Likewise, when discussing the interpretative function of the derivative lawsuit, it is noted that it closely resembles the preventive function, considering that the boundary of permitted behavior established in one case serves as guidance for future actions. In this regard, the division of functions of the derivative lawsuit continues to remain dichotomous between repressive and preventive functions. It can be said that it is undisputed that a derivative action serves both of the mentioned functions¹⁹, but the question that can be debated is which function is primary, both in legislative regulation of derivative lawsuits and in evaluating their effectiveness. The dilemma regarding the purpose of derivative lawsuits relates to the function that derivative lawsuits serve first in corporate law and then in society as a whole. In this regard, it is emphasized that a derivative lawsuit can either have a compensatory function (repressive function) or serve as a mechanism intended to deter breaches of duty to the company (preventive function). The question of the purpose of a derivative lawsuit is one of the more contentious topics related to derivative lawsuits and has multiple implications for the correct understanding of derivative actions. First of all, the determination of the purpose of derivative lawsuits affects the formation of the legislative framework for derivative lawsuits in each individual right, as derivative lawsuits primarily aimed at a repressive or preventive purpose cannot generally be based on identical legislative solutions. In this sense, the question of the purpose of a derivative lawsuit can be of great significance for determining the admissibility of the derivative lawsuit, which is very important in those rights where the court or independent individuals in the company decide whether to allow the continuation of the proceedings based on the lawsuit. At this stage of the proceedings, it is very significant to question whether the derivative lawsuit should serve solely to sanction unlawful behavior, or whether the derivative lawsuit has a 'higher purpose', that is, a preventive impact on the defendant's behavior. Namely, it may turn out that the costs of the procedure, both judicial and those preceding the preparation of the lawsuit, are greater than the benefits that society can achieve through a successful conclusion of the procedure. In such circumstances, the legislator's choice for the repressive function of derivative lawsuits would indicate that the continuation of the lawsuit should not be allowed, as the primary goal – compensation for damages – would not be achieved. On the other hand, a legislator's choice for the preventive function of derivative lawsuits would suggest that the lawsuit is allowed if initiating the procedure can serve as a precedent for the future, that is, how to proceed in the disputed situation²⁰. In the end, defining the purpose or function of a derivative lawsuit plays an important role when assessing the success of the derivative lawsuit as an institution of corporate law.

¹⁷ Savković Vladimir., (2004)., *Derivativne akcionarske tužbe*, magistrski rad, Pravni fakultet Univerziteta u Beogradu., str. 30.

¹⁸ Arad Reisberg., (2007)., *Derivative actions and corporate governance*, Oxford University Press., str. 51.

¹⁹ James D. Cox., (1999)., *The social meaning of shareholder suits*, Brooklyn Law Review., str. 8.

²⁰ Arad Reisberg., (2007)., *Derivative actions and corporate governance*, Oxford University Press., str. 56 - 60.

If the repressive function is primary, then the measure of success of the derivative lawsuit is determined by the number of court proceedings that have concluded with the acceptance of the claim. On the other hand, if it is considered that the primary preventive function is in place, then procedures that have not been successfully completed for any reason may still be significant, as long as their preventive actions lead to a reduced number of cases in which duties to society are violated. Additionally, if the derivative lawsuit is viewed through the repressive function, then the only alternative available to the derivative lawsuit is a direct lawsuit filed by the society or insurance for the liability of the defendants (primarily management)²¹. On the other hand, if the derivative lawsuit is viewed through a preventive function, then other legal remedies provided by corporate law (other mechanisms of corporate governance) can serve the same purpose. For example, it is believed that providing compensation in the form of company shares, as well as publishing rules, may contribute more to directors acting in the interest of the company than the fear of the possibility of filing a derivative lawsuit²².

3. DERIVATIVE LAWSUIT AND CORPORATE LAW

Company law represents the main branch of law within which derivative lawsuits are studied; however, depending on the authors' approach and the context of the analysis, the literature presents various perceptions of the place and role of derivative lawsuits in company law. In Serbian corporate legal literature, derivative lawsuits are analyzed as a general institution of corporate law.²³, and then also as a special right of minority shareholders. Both approaches to the derivative lawsuit, although fundamentally correct, are nonetheless imprecise, as the application of the derivative lawsuit in companies is excluded or at least questionable, which will be discussed in the following chapter, which is why the derivative lawsuit does not represent a general institute of corporate law. Furthermore, the derivative lawsuit is not a right held only by minority shareholders, but also by members of limited liability companies. In this regard, when it comes to Serbian law, the derivative lawsuit can most accurately be defined as a general institute of capital companies. In comparative literature on corporate law, a derivative lawsuit is mainly analyzed as the right of minority shareholders, or as one of the mechanisms for judicial protection of shareholders, with an emphasis on it sometimes being an important instrument for protecting investors²⁴. In addition to the above, the derivative lawsuit is sometimes studied alongside the institute of special duties of the company's directors, as a mechanism that serves the forced realization of special duties²⁵. Finally, the derivative lawsuit is studied in the context of general teachings on shareholder lawsuits, as one of the lawsuits available to shareholders concerning membership in the company²⁶. In this case, the perception of derivative lawsuits is somewhat different from the understanding of minority shareholders' rights. A key feature of contemporary comparative legal literature is that derivative lawsuits are most commonly analyzed within the framework of the study of corporate governance, where they are perceived as one of the mechanisms for solving agency problems²⁷.

²¹ Arad Reisberg., (2007)., *Derivative actions and corporate governance*, Oxford University Press., str. 59.

²² Daniel R. Fischel., Michael Bradley., (1986)., *The Role of Liability Rules and the Derivative Suit in Corporate Law: A Theoretical and Empirical Analysis*, str. 37 – 38.

²³ Vasiljević Mirko., (2013)., *Kompanijsko pravo – pravo privrednih društava*, Pravni fakultet Univerziteta u Beogradu., str. 127 - 147.

²⁴ Ann M. Scarlett., (2011)., *Imitation or Improvement? The Evolution of Shareholder Derivative Litigation in the United States, United Kingdom, Canada, and Australia*, Arizona Journal of International and Comparative Law, Saint Louis U. Legal Studies, Research Paper No. 2011-36., str. 571.

²⁵ Brian R. Cheffins., Bernard B. Black., (2006)., *Outside Director Liability Across Countries*, European Corporate Governance Institute, Working paper No. 71/2006., str. 1403.

²⁶ Roberta Romano., (2010)., *Foundation of Corporate Law*, Foundation Press., str. 246 - 487.

²⁷ Arad Reisberg., (2007)., *Derivative actions and corporate governance*, Oxford University Press., str. 17 - 46.

In this case, the doctoral dissertation of Professor Arad Reisberg, defended in 2005 at the University of Oxford and later published in 2007 as a monograph titled "Derivative actions and corporate governance," certainly stands out as the work that analyzes in detail the relationship between derivative actions and general theories of corporate governance. It is noteworthy that in comparative literature, derivative actions are rarely analyzed in relation to specific agency problems, but are generally understood as a general mechanism of corporate governance. Although the correctness of the aforementioned interpretations of derivative lawsuits cannot be disputed, a complete understanding of the place and role of derivative lawsuits in corporate law is necessary to be rounded out by considering the relationship between derivative lawsuits and general corporate law rules. In this regard, the derivative lawsuit represents one of the few institutes of corporate law that allows the will of the company to be expressed by a minority in the company. Corporate law has had two functions since its inception to the present day – to establish the principles of functioning of a company as an independent legal entity and to create mechanisms for resolving conflicts that may arise within the company²⁸. As a consequence of the first function of corporate law, a rule regarding the distribution of authority for decision-making by the company was established, followed by a rule of majority decision-making, if the company's decisions are made by a collective body. The principle of majority decision-making is a result of the development of corporate law, because at the very beginning, corporate law required that decisions of the members, at least the most significant ones, be made unanimously²⁹. Over time, with the development of the needs of practice, the principle of unanimous decision-making was abandoned, and the principle of majority decision-making was established, which is considered to be grounded precisely in the case of *Foss vs Harbottle*, which also established the derivative action. However, as a sort of compensation for the abandonment of the rule of unanimous decision-making, corporate law has created protective mechanisms for the minority in the company, who, due to their position, are unable to oppose decisions they disagree with. This is how the emergence of special rights for dissenting shareholders is explained in the literature. In this regard, the basic idea on which the rights of minority members are based is to protect those members who, due to their position in society, are unable to influence the decision-making process on behalf of society³⁰. However, regardless of all the aforementioned, the qualification of derivative lawsuits as the rights of minority members in a legal-technical sense may be disputable, which will be discussed in the following presentations. Furthermore, the qualification of derivative lawsuits as the rights of minority members is additionally disputable, as a derivative lawsuit is not directly aimed at protecting the minority in society, but rather at protecting the society itself, and the protection of the minority is an additional but not necessary effect, which is a significant difference between a derivative lawsuit and the rights of minority members in the true sense of the term. Given the above, in the context of corporate law, a derivative lawsuit can be most precisely defined as a corrective legal mechanism that aims to address issues in the formation and expression of the legally relevant will of the company, in order to ensure that individuals who, under normal circumstances, make decisions on behalf of the company can be held accountable to the company for the decisions they make. In this regard, the derivative lawsuit, due to its potential significance for corporate law, transcends the realm of individual institutes to which its application is usually linked, whereby as a corrective mechanism of corporate law it can have the status of a general institute or an institute that is applied only to capital companies, depending on the approach of the specific legislation.

²⁸ Reinier Kraakman, et.al., (2009), *The Anatomy of Corporate Law*, Oxford University Press., str. 35.

²⁹ Charles R. Korsmo., Minor Myers., (2014), „The Structure of Stockholder Litigation: When Do the Merits Matter”, *Ohio State Law Journal* Vol. 75, No. 5., str. 859.

³⁰ Paul Davis., (2010), *Introduction to Company Law*, Oxford University Press., str. 219 - 221.

In the end, it is necessary to mention that a derivative lawsuit is sometimes understood as a form of "piercing the corporate veil" of a company because it allows the members of the company to file a lawsuit to protect the rights of the company, thereby blurring the delineation between the subjectivity of the company and its members and effectively allowing the rights belonging to the company to serve the interests of its members³¹. Although this understanding may seem acceptable at first glance, it is based on the identification of two principles of corporate law – the separation of the subjectivity of a company and its members, and the authority to make decisions on behalf of the company. In the case of a derivative action, although there is actually protection of the company's rights by its members, which may also serve to protect the interests of the members, this does not occur based on the identification of the legal subjectivity of the company and the member of the company who files the lawsuit, but rather based on the redistribution of authority to make decisions on behalf of the company, as the company can only express its will through the will of the individuals that make up its governing bodies. The delegation of authority to make decisions on behalf of the company in a derivative action is, by its nature, legal, special, and of limited duration. Namely, in the case of a derivative suit, a member of the company, by law, obtains special authority to represent the company in the dispute arising from the derivative lawsuit until its conclusion. In this way, the position of the member who brings the lawsuit can be explained by the theory of representation, as the company member conditionally exercises a representative function in the proceedings (even though the lawsuit is filed in their own name), which typically belongs to other bodies within the company, most often the management.

3.1. Individual and derivative lawsuits in company law

The legal regulation of the functioning of the economy based on market principles in our country began in the 1980s and has been continuously improving with new solutions since then. Following the trends of developed countries, our legislation introduces special lawsuits of corporate law into the legal system of the Republic of Serbia. These are individual lawsuits and derivative lawsuits. (*actio pro socio*-lawsuit for the company). An individual lawsuit may be filed by a member of the company in their own name and for their own account against a person with special duties for compensation for damages caused to them by that person's violation of special (fiduciary) duties to the company. A member of a company can file a derivative lawsuit against individuals who have special (fiduciary) duties to the company for a breach of duty. A member can file this lawsuit if they meet the appropriate capital threshold and if they have requested in writing that the company file a direct lawsuit, and the company rejects this request or does not act on it. The introduction of individual and derivative lawsuits into our legal system is certainly a positive fact. After World War II, in the former Yugoslavia (as well as in all socialist countries), the concept of market economy development was abandoned. The state exclusively managed economic life. Planned economy, state directives, and other activities of state and party organs replaced market principles and laws. This situation lasted until the late 1980s, when the communist regimes collapsed and a gradual opening towards a capitalist mode of production began. The opening towards market business created a huge empty space that needed to be legally regulated. With the adoption of the Companies Act in 1988³² a definite turn towards a market economy has been made, the beginning of a search for legal regulations that will best suit market-oriented business. However, this law did not recognize class action lawsuits.

³¹ Raoul Berger., (1955)., „Disregarding the Corporate Entity for Stockholders' Benefit", Columbia Law Review Vol. 55, No. 6., str. 815 – 821.

³² Sl. List SFRJ 77/88, 40/89, 46/90, 61/90.

Law on Enterprises from 1996³³ it recognizes individual and derivative lawsuits, as well as company lawsuits, whereby individual lawsuits were allowed only to members of capital companies but not to partnerships. The tendency for further regulation of individual and derivative lawsuits is based on the Company Law from 2004.³⁴ as well as the Company Law from 2011³⁵. Despite this positive process, there has not been a significant application of these institutes in judicial practice in the territory of the Republic of Serbia. Several reasons are cited as the cause of this situation. However, the most important reasons for this situation are considered to be, on one hand, that institutes of a capitalist market economy have not yet sufficiently established themselves, and on the other hand, that these institutes (individual and derivative lawsuits) must undergo further changes, with new solutions, in order to promote the application of these institutes in judicial practice. It should also be noted that even in other countries with a continental legal system, where market economies have long existed, individual and derivative lawsuits are not sufficiently utilized. The company regulations establish the possibility for shareholders to raise three types of lawsuits³⁶:

- individual (direct),
- collective (direct), and
- derivative (derived).

3.1.1. Individual lawsuit

From a comparative legal perspective, it can be said that all legislations recognize and regulate individual lawsuits. The Companies Act of 2011 in Article 78.³⁷, it stipulates that a member of the society may file a lawsuit against individuals who have special duties towards the society for compensation for damages caused to him by that individual breaching special duties towards the society. Persons who have special duties towards the company are partners and complements, members of a limited liability company who possess a significant stake in the company's equity, or a member of a limited liability company who is a controlling member of the company, shareholders who possess a significant stake in the company's equity or a shareholder who is a controlling shareholder in the company, directors, members of the supervisory board, representatives, proxies, and the liquidator. If desired, a company can expand the circle of individuals who have special duties towards the company through its founding act or statute. Significant participation in the equity capital exists when an individual independently or together with related individuals holds 25% of the voting rights in the company. A controlling member or shareholder is a person who, based on independent action or joint action with other individuals, has the right or ability to exert controlling influence over the operations of another person through participation in the equity capital, contracts, or the right to appoint the majority of directors or members of the supervisory board. Special duties (fiduciary duties) towards the company are:

- duty of attention,
- duty to report jobs and actions in which there is a personal interest,
- duty to avoid conflicts of interest,
- duty to keep business secrets, and- duty to respect the non-compete clause.

An individual lawsuit protects the interests of the members of the company, not the company itself, so the compensation for damages pertains solely to the damage that a member of the company has directly suffered, and not to the damage suffered by the company alone.

³³ Sl. List SRJ 29/96, 33/96, 29/97, 59/98, 74/99, 9/01 i 36/02.

³⁴ Sl.Glasnik RS 125/04.

³⁵ Sl.Glasnik RS 36/11, 99/11, 83/14, 5/15.

³⁶ Vasiljević, M., (2007)., Korporativno upravljanje., str. 245.

³⁷ Sl.Glasnik RS 36/11, 99/11, 83/14, 5/15.

A member of the company is obligated to cumulatively prove that they have directly suffered damage and that there is a causal link between the actions taken or the omissions of persons who have special duties to the company or the organs of the company and the occurrence of damage. A member of the company submits an individual lawsuit in their own name and for their own account.

3.1.2. Derivative lawsuit

According to our Company Law from 2011.³⁸ article 79. provides for the filing of a derivative action, so that one or more members of the company can file a lawsuit against individuals who have specific duties to the company for breach of the duty of care, for violating the rules on approving transactions where there is a personal interest, for breaching the duty to avoid conflicts of interest, for violating the obligation to maintain business confidentiality, and for violating the rules on non-competition. A member of the company submits a derivative lawsuit in their own name but for the account of the company (*actio pro socio* – action for the company) provided that they hold a stake or shares representing at least 5% of the company's equity capital and that prior to filing the derivative lawsuit, they have contacted the company in writing with a request to initiate a lawsuit on that basis, and the request has been denied or the company has not responded to it. While an individual lawsuit secures the protection of the direct interests of the members, a derivative lawsuit ensures the protection of the interests of the company itself. Indirectly, this protection also safeguards the interests of the members. Essentially, the primary plaintiff in these disputes is solely the company. However, the problem arises from the fact that the primary plaintiff is a legal entity, which raises the question of the manifestation of the will of the company. For example, in a joint-stock company, there are different bodies (depending on the management system), and each of these bodies has its role in the functioning of the joint-stock company. According to older understandings, the position of the shareholders' assembly is dominant, and the assembly determines the will of the company. However, starting from the reform of German corporate legislation in 1937, the view of the dominant position of the shareholders' assembly and its general, unlimited authority is abandoned. Its general authority becomes specific, limited to the area from which management is excluded³⁹. According to modern understandings, the interrelationships of all organs in society function according to two basic principles:

- the principle of hierarchy and
- the principle of independence.

These principles do not exclude each other, although this may seem so at first glance. The essential issue of mutual relations and the functioning of bodies in a joint-stock company is finding the best measure (balance) between these two principles. By combining these two principles, the independence of the company's bodies is ensured, but also the execution of tasks by hierarchically superior bodies. Any potential confusion of jurisdiction and responsibilities among bodies (and thus determining the will of the company) is avoided by applying imperative legal norms. The legislator stipulates the scope of the bodies that cannot be taken away or transferred. When powers and responsibilities are precisely defined by law, the will of society and the hierarchy of bodies are also clearly determined and established. Thus, the issue of implementing the decisions of the assembly is not posed as a matter of hierarchy, but the implementation of assembly decisions is treated as an independent competence of the management board, as that is its competence established by law.

³⁸ Sl.Glasnik RS 36/11, 99/11, 83/14, 5/15.

³⁹ Arsić, Z., (1998)., *Interes akcionarskog društva*, Pravo i privreda br.5-8/98.

Therefore, in comparative law, the prevailing opinion is that there is no hierarchical relationship between the bodies of a joint-stock company; rather, they are mutually independent due to the clear legal delineation of powers. However, in some national laws, the issue of hierarchy is presented differently. For example, in Czech law, the assembly is defined as the highest body of the joint-stock company, which is why it is considered that the supreme will of the company is established through its decisions⁴⁰. Therefore, the will of the society is expressed by the organs of the society through decisions made within their jurisdiction. This further means that it is precisely the members of these organs who can be sued for violating their duties that cause harm to the society. Keeping this in mind, we can reasonably assume that those who ought to be sued will obstruct (prevent) the initiation of a lawsuit by the society. National legislations have addressed this problem by allowing members of society (under certain conditions) to file these lawsuits. However, providing the option to file derivative lawsuits can create another problem. There may be intentional filing of a large number of derivative lawsuits without a valid reason (to achieve some other goals), and this situation can only harm society as it will hinder its regular operations. Therefore, national legislations are introducing additional conditions that must be fulfilled in order to prevent the "inflation" of derivative lawsuits. First of all, a derivative lawsuit can be filed by a member of a company who owns shares or stocks representing at least 5% of the company's basic capital. This condition must exist at the time of filing the lawsuit, and it does not matter whether the basis for filing the lawsuit arose before or after acquiring the status of a company member. The Law on Business Companies from 2011 does not provide for the possibility of cumulative percentage participation in the basic capital, so if there are multiple members filing a derivative lawsuit, each of them individually must meet the capital threshold. If the lawsuit is filed by a member who meets the capital threshold, other members who also meet the capital threshold can ask the court where the proceedings are held to intervene in the lawsuit as interveners on the side of the plaintiff. However, our Law on Companies from 2004,⁴¹ he had a milder condition regarding the calculation of the capital threshold. Namely, according to the Company Law from 2004, it was stipulated that if there are multiple members or shareholders, their shares must be summed up and together must reach a capital threshold of 5% of the basic capital. It should also be noted that according to the Company Law from 2004, a limited partner in a limited partnership, a member of a limited liability company, or a shareholder of a joint-stock company could file a derivative lawsuit. According to the Company Law from 2011,⁴² A derivative lawsuit can be filed by a member of the company who holds shares or stocks representing at least 5% of the company's basic capital. This formulation raises the question of whether filing a derivative lawsuit is possible in limited partnerships and general partnerships, since the possibility of raising a derivative lawsuit is tied to the basic capital (capital census) which does not exist as an institution in limited and general partnerships. By applying linguistic interpretation of the legal norm, it can be concluded that this lawsuit can only be filed by members of limited liability companies and shareholders of joint-stock companies. A member of the company who acquired shares or stocks in the company from a person who filed the derivative lawsuit can join the lawsuit in their place, provided that this person agrees. This subjective amendment of the lawsuit is possible until the final conclusion of the proceedings, as well as in the procedure for an extraordinary legal remedy. Before filing a derivative lawsuit, a member of the company (who meets the capital threshold) must, in advance, address the company with a written request for the company to file the lawsuit itself. The legislator requires a written form of the request but does not specify its content. Regardless of this fact, depending on the circumstances of each specific case, it is clear what this written request must contain.

⁴⁰ Bučková, Ivana., (1999)., *Organe der Tschechischen Aktiengesellschaft*, Beč.

⁴¹ Sl.Glasnik RS 125/04.

⁴² Sl.Glasnik RS 36/11, 99/11, 83/14, 5/15.

First of all, these are the data identifying the applicant, then data about the person against whom the lawsuit should be filed, how the claim will be phrased, and certain evidence to support the applicant's claims. After receiving the written request, the company has a period of 30 days to respond to it. This period is preclusive. In the specified period, the company can proceed in one of the following ways:

- accept the claims of the request and file a direct lawsuit;
- reject the request to file a lawsuit;
- not act at all on the request.

If the company does not act on the request, it is considered that the request has been rejected, and after the expiration of the exclusive period, the member is authorized to file a derivative lawsuit. If the company decides to file a direct lawsuit based on the written request received from the member, that lawsuit must be filed against the identified person in the request, and also, the claim must be as stated in the written request. In derivative lawsuits, the issue of the possibility of so-called Multiple Derivatives is always raised. Multiple Derivation represents the possibility of filing derivative lawsuits not only where the person is a member or shareholder but also in affiliated companies (sister company, or parent company, or subsidiary company). Our Company Law from 2004 did not allow for the possibility of multiple derivation. However, according to the Company Law from 2011 regarding rights, obligations, and responsibilities from the control and management contract, the controlling company has the right to issue binding instructions to the dependent company regarding the conduct of business, guided by the interests of the group. The directors of the controlling company are obliged to give instructions to the controlled company with the care of a good businessman and the provisions on special duties apply to them. This leads to the conclusion that multiple derivations are allowed in this way, but are limited only to the directors of the controlling company. In the case of initiated derivative lawsuits, out-of-court settlement is not possible. The purpose of this solution is to prevent various possible abuses by the participants in the process (agreements between lawyers, qualified shareholders, investment funds, etc.). However, it is interesting to note the position that judicial settlement is allowed. Thus, parties should submit a proposal for settlement to the court, which will express its opinion on it. Involving the court in the settlement certainly eliminates the possibilities of malpractice by the participants in the process. The Law on Companies from 2011 does not contain direct provisions regarding deadlines for submitting derivative lawsuits, so in that situation, the deadlines for filing lawsuits against persons who have special duties to the company may be applied, which is a period of 6 months from the moment of learning about the committed breach (subjective deadline), or 5 years from the committed breach (objective deadline). When speaking about the right to raise a derivative lawsuit against individuals with special duties towards the company, in joint-stock companies, this primarily refers to the management and supervisory bodies, as these are the bodies that have certain authorities regarding the management of the company's affairs and the supervision of those affairs. The powers belonging to the management and supervisory bodies must certainly be accompanied by the responsibility of these bodies in the event that they do not exercise their powers in accordance with the law, the relevant acts of the company, or adopted decisions. It should be emphasized that this responsibility primarily lies with the joint-stock company. However, they must also take into account the interests of the shareholders, creditors of the company, and so on. When we talk about the concept of responsibility of individuals with special duties towards a joint-stock company, we should take into account the solutions provided by two major legal systems:

- the Anglo-American legal system and
- the continental legal system.

4. PROPOSALS AND GUIDELINES FOR THE DEVELOPMENT OF THE NATIONAL LEGAL FRAMEWORK FOR THE INSTITUTE OF DERIVATIVE ACTIONS

The underdevelopment of this institute in national business and judicial practices should not be surprising given its controversial nature, which has made it difficult to implement in the jurisdictions of almost all countries that have introduced it into their legal lives. The controversial nature of derivative lawsuits is perhaps best illustrated by the fact that in formulating the Principles of Corporate Governance by the American Law Institute (ALI), nothing proved to be more demanding than the efforts to develop unique and balanced standards for derivative lawsuits, and that only the topic of corporate takeovers seemed to provoke an equally intense level of emotion among corporate lawyers. Namely, the institute of a derivative lawsuit has a systemic flaw, of an irremediable nature, and that is that filing a lawsuit from a shareholder on its own behalf, and on behalf of the joint stock company whose shares are owned, practically means that there is no direct interest of the shareholder in filing a lawsuit, because success in the dispute means direct benefit exclusively for that company and indirect benefit for the plaintiff and other shareholders who were not plaintiffs (positive effect on the price of shares). Since the systemic lack of the institute of derivative action is irreversible because it is determined by its very essence, then in order to popularize this institute, it is necessary to do everything in the field of national regulation of this institute to eliminate the "limiting" factors of a remediable nature in order to make this institute attractive enough for potential "users" – plaintiffs²³. First and foremost, this is a question of the capital threshold. Namely, while the Montenegrin ZPD opted for a completely liberal approach by abolishing the capital threshold, allowing every shareholder to exercise their right to file derivative lawsuits, in the ZPD of the Republic of Serbia, a capital threshold of 5% is stipulated.

In this sense, it remains unclear based on which criteria the legislator opted for the amount of 5% as it is certainly an inadequate percentage, considering the current ownership structure of joint-stock companies in Serbia²⁴, only 2% of the shareholders who are individuals would fulfill this condition for filing a derivative lawsuit. The only explanation for prescribing this percentage of capital participation is the "blind copying" of the basis for realizing the rights of minority shareholders contained in the European Union Directive on shareholder rights²⁵, which national laws stipulate that 5% is the maximum capital participation that can be provided to achieve the aforementioned rights. In addition to the additional question of why the Serbian ZPD opted for the prescribed maximum, it is recommended to revise the existing legal solution regarding the amount of capital censorship as a procedural prerequisite in order to align it with the current ownership structure of joint-stock companies in Serbia. On the other hand, excessive laxity towards the Montenegrin ZPD is not recommended, because despite the fact that due to inadequate information and professionalism of shareholders in Montenegro, cases of filing derivative lawsuits are rare, and hence there is no justified risk of vexatious litigation, it gives the impression that the current solution is largely imprudent. For this reason, the prescription of a capital threshold that would be adequate to the ownership structure of joint stock companies by the Montenegrin legislator would be advisable as a sort of filter to prevent useless lawsuits. The difficulties in defining the capital threshold as a condition for filing a derivative lawsuit indicate that the focus of regulating the conditions for filing a derivative lawsuit should be on the preliminary request. In this regard, the capital threshold should serve as a purely preliminary filtering mechanism for unnecessary lawsuits, while the preliminary request should play a key role in this matter.²⁶ Due to the immense significance that the obligation to submit a prior request has in derivative proceedings, it is recommended that the form, content, and method of submitting the request be precisely regulated by imperative legal norms.

Taking into account the significance of the previous request, it is advisable to extend the deadline for the governing body to respond to it, since the current deadline of 30 days does not provide much leeway for the management to conduct a detailed analysis of the facts and claims contained therein, as well as expert opinions, for which the need may arise in the process of considering the request. The issue of litigation costs for conducting the procedure represents yet another in a series of disincentives that need to be considered. Namely, according to the existing resolution, litigation costs are borne by the plaintiff until the conclusion of the proceedings, with the possibility of reimbursement by the company in case the proceedings end in the plaintiff's favor. Thus, the failure in the lawsuit, whether partial or complete, is a cost risk for the plaintiff, as well as the advance costs during the proceedings (direct and indirect - court fees, attorney's fees, procedural costs - witnesses, experts, etc.).²⁷ For this reason, it is recommended to design a different mechanism for the distribution of litigation costs, with a suggestion that this should start from the diligence of the plaintiff. In this sense, it may be necessary to stipulate the plaintiff's right to claim reimbursement of procedural costs from the company, regardless of the outcome, if the plaintiff did not know, nor could know about the facts that would indicate that the lawsuit was unfounded, or that filing it was unnecessary, and that the costs that a member of the company could claim would be determined in accordance with the costs that were awarded or could have been awarded by the judgment of the civil court, depending on whether the dispute was successfully or unsuccessfully concluded.²⁸ The same logic suggests that it would be justified to introduce certain direct incentive mechanisms for plaintiffs. To this end, following the example of Anglo-Saxon solutions, the introduction of direct pro rata compensation should be considered within national frameworks. Namely, although such compensation is often criticized for jeopardizing the interests of the company's creditors, it nevertheless remains consistent with the proclaimed goal and essence of derivative lawsuits, as the awarded damages continue to go to the company, while the shareholder-plaintiff would only have a right to a certain percentage of it (most often proportional to the stake in the company's capital). Ultimately, the interests of the company's creditors would be at much greater risk if it had not been for the 'correction of injustice' inflicted upon the company by the improper actions of management, and this correction was solely thanks to the shareholder who made efforts to protect the company, and therefore it would be fair to reward him for such engagement. In addition, it is believed that the allocation of pro rata compensation would represent a kind of motivation for shareholders and a step forward in overcoming the problem of 'shareholder apathy', which is widely present in both Serbia and Montenegro. For this reason, we believe it is essential to work on educating shareholders about instruments for protecting their own rights, given that a negligible percentage of them are even aware of the content of their rights, and even fewer are aware of instruments for their protection. This problem should be approached seriously considering the currently very pronounced information asymmetry between shareholders and the company's management bodies. Therefore, it would be advisable to develop a practice in the future of including provisions regarding the legal basis and method of submitting derivative lawsuits in share purchase agreements and company statutes for lesser-known institutes, such as derivative lawsuits, so that shareholders can be better informed about this possibility, which is, unfortunately, completely unknown to the majority at present. Furthermore, it has already been pointed out the necessity of prescribing a derivative lawsuit as an exception to the principle of formal legality by determining the shareholder who initiated the derivative action as an actively legitimized party and for initiating enforcement proceedings based on a judgment rendered in a derivative lawsuit, due to a justified risk that the company, as the enforcement creditor, might miss the opportunity to exercise the right to compensation for damages, recognized by a final judgment rendered in its favor. Another recommendation concerns the stipulation of the possibility to conclude the derivative proceedings through an out-of-court settlement.

Namely, it has been previously pointed out the omission of the current Company Law to express its position regarding the issue of settlement, unlike the previous one which explicitly prohibited it. This could be interpreted as a step towards introducing settlement into the national normative framework, but the absence of explicit provisions regulating the settlement process does not leave room for resorting to this form of concluding a derivative action. Although it cannot be said that the judiciary is burdened by proceedings based on derivative lawsuits, the absence of this argument should not be considered a limiting factor for the introduction of the settlement institute. However, due to a number of possible abuses that this institute may face, it seems justified to condition its finality on ratification by the court, with a prior obligation to inform other shareholders about the content of the reached agreement. Finally, it is necessary to consider the institutionalization of the multiple derivatives institution in cases where the parent company holds more than half of the participation in the capital of the subsidiary company.

5. CONCLUSION

A derivative lawsuit can most simply be defined as a lawsuit filed by members, in their own name, but on behalf of the company, and it fundamentally represents a corrective mechanism of corporate law that serves to protect the property interests of the company in circumstances where the interests of the company have been harmed by persons who should primarily protect them. Considering that the protection of the interests of the company is a key element of derivative action, the qualification of derivative action as the rights of minority shareholders or a mechanism of corporate governance in the corporate law system is not entirely correct, since the interest of shareholders or other entities cannot be primary when structuring the legislative framework for derivative action, nor in its application. In this regard, the authorization to file a derivative action represents part of the legal position of the shareholder, rather than their subjective right, and ultimately, in addition to protecting the interests of the company (which is the primary function), it should also contribute to the protection of the economic interests of the shareholders. The derivative action, although certainly not the most important institution of corporate law, is one of the few institutes that reflect the essence of this branch of law. Namely, through the regulation of the derivative action, the fundamental principles of corporate law are manifested, which can be concluded based on the historical development of the derivative action. At the same time, the historical development of the derivative action in a simplified form also illustrates the historical development of corporate law itself. At the very beginning of the development of derivative lawsuits, corporate law sought to separate the subjectivity of the company from its members as much as possible, as well as to preserve the established jurisdiction for decision-making on behalf of the company. The conditions for filing a derivative lawsuit were formulated in the same pattern under the famous rule of *Foss v Harbottle* (the traditional understanding of derivative lawsuits). At the moment when there was no longer a need to primarily protect the fundamental principles of corporate law through derivative lawsuits, a more significant question arose, namely what constitutes the content of the legal subjectivity of the company, which also involves the question of what represents the interest of the company as an independent legal entity and which individuals have the authority to decide what is in the interest of the company in each specific case. In that sense, the regulation of derivative lawsuits should no longer serve solely to preserve the fundamental principles of corporate law, but rather, the derivative lawsuit should primarily serve to protect the legitimate interests of the company, which in certain circumstances implies that the lawsuit should not be filed, regardless of the fact that the lawsuit has good prospects for success in the dispute. Thus, in relation to derivative lawsuits, the question today is not only whether the lawsuit can be successful, although that is still an important question, but whether the lawsuit is in the interest of society, which are two completely separate issues (modern understanding of derivative lawsuits).

Considering all of the above, a derivative lawsuit can also represent a confirmation of the theory of the fiction of the legal subjectivity of the company, because the discussion about the derivative lawsuit boils down to which physical persons within the company have the right to decide what constitutes the interest of a business company, whether that interest has been violated, as well as whether it is necessary to initiate judicial proceedings due to the identified violation of the company's interests. Based on the above, it can be concluded that the purpose of a derivative action is the enforced realization of sanctions prescribed within the material domain of the application of derivative action. In Serbian law, these are violations of special duties to the company, rules on restrictions on payments in a joint-stock company, and the exclusion of a member from a limited liability company. In foreign literature, and under its influence in our literature, the preventive purpose of derivative lawsuits is usually given priority, whether it is said that this is the only purpose of a derivative lawsuit or that it is a primary purpose in relation to the repressive purpose. Emphasizing the preventive purpose of derivative lawsuits essentially represents an idealization of derivative lawsuits, which may be one of the reasons why derivative lawsuits are sometimes assessed as not a very useful legal institution. Namely, the emphasis on the preventive purpose of derivative lawsuits is based on a misunderstanding of the relationship between two separate segments of corporate law, namely, the material domain of application of derivative lawsuits and the derivative lawsuit itself considered independently. The duties prescribed within the material domain of application of derivative lawsuits are those that should act preventively, as they provide guidelines on behavior towards the company. However, when the duties as a preventive mechanism fail, then follows the procedure under a direct or derivative lawsuit, which has as its basic, or at least primary, goal the removal of consequences arising from the violation of specific duties towards the company. Therefore, the purpose of a derivative lawsuit is to enforce compensation for damages or another property law claim of the company that arose as a result of the breach of duty towards the company. Undoubtedly, a derivative lawsuit, like any other lawsuit, can have a preventive effect on certain individuals, in the sense that the mere possibility of filing a lawsuit will deter them from unlawful behavior (the so-called repression for the purpose of prevention). However, considering that the reasons for a particular behavior remain on the level of the inner sphere of each individual, it is difficult to uncover the reason for a specific behavior. In this regard, the preventive function of a derivative lawsuit is difficult to measure and, as such, can hardly represent the primary purpose of a derivative lawsuit. Also, in law, there is a well-known division into general and special prevention, so an additional question can be posed as to whether a derivative lawsuit aims for special or general prevention or both. All the aforementioned are complex issues that definitely should be part of the discussion on the purpose of the existence of derivative lawsuits; however, it should be concluded that the primary purpose of a derivative lawsuit, which is also defined by law, is to realize the property legal claim of the company. Highlighting the preventive function of derivative lawsuits is not sustainable, as long as achieving this function is not set as a primary condition for filing a lawsuit, which is not the case in Serbian law, nor in other legal systems. Regulating economic relations based on market principles in Serbia does not have a long tradition. Hence, specific corporate lawsuits, both individual and derivative, lack a basis in case law and remain relatively unknown institutions in our country. The use of these lawsuits in judicial practice is almost negligible. However, the reasons for this situation should not be sought solely in the short passage of time. Namely, when viewed comparatively, there are also problems in the application of individual and derivative lawsuits in legal systems with a long tradition of these institutes. This leads to a well-founded conclusion that the causes of the insufficient application of these institutes should be sought primarily in their definitions, conditions, specific solutions, and limitations. This primarily refers to derivative lawsuits.

Above all, any potential damages belong to the company and not to the member as the filer of the derivative lawsuit, which means that the individual has no interest in filing this lawsuit. On the other hand, the costs of financing the court proceedings fall on the member or shareholder who filed the derivative lawsuit. He will only be able to recover these costs in the case of a successful conclusion of the lawsuit. Furthermore, the prescribed capital threshold as one of the prerequisites for filing a derivative lawsuit limits the application of this institute, hence it is proposed to reduce the capital threshold or to completely exclude it. There are also remarks regarding the circle of actively legitimized persons for filing derivative lawsuits. There are many proposals to expand this circle of persons to include the creditors of the company. Moreover, the institute of derivative lawsuits would gain importance and attractiveness by allowing multiple derivations. This would open up the possibility of filing a derivative lawsuit not only in the company where one is a member or shareholder, but this right would also exist in relation to affiliated companies. An individual lawsuit protects the interests of the members of the company, not the company itself. Thus, the compensation for damages relates to the damage that a member of the company has directly suffered. The filer of the individual lawsuit is obligated to prove the existence of damage and its extent that has occurred due to the actions or omissions of persons with specific duties towards the company.

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POSSIBILITIES OF DEVELOPMENT AND IMPLEMENTATION OF NEW TECHNOLOGIES AND INNOVATIONS IN THE MODERN WORLD

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ABSTRACT

The main characteristic of the modern business environment is turbulence, dynamism, unpredictability with pronounced competition at the global level. New challenges are constantly emerging that the management of a modern organization must face in order to achieve efficient and effective business operations. The research and innovative approach to successful business operations of a modern organization is imposed as an imperative in global market conditions. In order to develop the flexibility and adaptability of the organization, it is necessary to respond to the challenges of the modern environment with a continuous innovative approach to business operations. From an economic point of view, innovations represent a creative process, a generator of change that creates new values based on two or more existing facts. Innovations also implement the process of broader social changes, as a logical consequence of the use of new technology and approaches to successful business. An innovative approach in economic terms refers to objects, phenomena and processes. Changes are an indispensable companion of the modern business environment. They impose themselves as dynamic, unpredictable, irreversible variables that condition the development of the economy and society. The importance of efficient and effective innovation management is extremely relevant to the successful operation of modern organizations and the development of the economy in general. New technology has transformed the way we work, giving us access to new methods, tools and resources. It can be physical or digital and includes everything from simple hand tools to complex computer systems. Technological innovations have a profound and far-reaching impact on all aspects of our lives. They change the way we communicate, do business, heal, learn and express ourselves artistically. The result of these innovations is a comprehensive impact on society, economy, culture and environment.

Keywords: *global market, innovations, modern organization, new technologies*

1. INTRODUCTION

The theoretical framework for studying innovation as a key factor for gaining and maintaining competitive advantage is extremely rich and relevant. Namely, in the literature we come across different approaches to defining this phenomenon, which range from observing innovation exclusively as a technological phenomenon, in the sense of a new product or production process, as a social phenomenon, i.e. as market innovations, innovations in the field of management, political and institutional innovations, and finally innovation as a process, a set of activities that leads from an idea, an invention to its commercialization.

No matter how you look at the phenomenon of innovation, there is great agreement in the literature that innovation is a key factor in achieving and maintaining the competitive advantage of a modern organization, as an imperative for its successful business. Competitive advantage on the market, or simply put, the superiority of the organization in relation to existing and potential competitors, is achieved primarily by the speed and agility of introducing new, improved products/services that meet the preferences and demands of consumers, as a central dimension of modern business.

2. THE TERM OF INNOVATION

From the organizational aspect, innovation represents a set of activities that create a change in existing resources, and contributes to the improvement of the business system's offer, the way it offers and delivers its products or services. By using the possibilities, the efficiency and effectiveness of business is increased, by creating new models and approaches. The real challenge and feature of modern successful business is dealing with unique, non-routine problems, where an innovative approach plays a key role. Managers are forced to create something new, change or transform one value into another, with a fresh, authentic approach to looking at market opportunities, which affects the company's successful operations (Drucker P.F., 1996, p. 37-38). There are numerous definitions of the concept of innovation in contemporary theory and practice. Earlier, innovations were seen as the creation of new ideas, approaches, as an individual and spontaneous process of creativity. Today, when the business circumstances have changed significantly and imposed the need for flexibility and adaptability to constant changes in the highly competitive market, the necessity of a more precise definition of the term innovation naturally arose. One of the most acceptable definitions was given by Drucker, who believes that "innovation is an action that endows resources with new capacities for creating wealth. There is no such thing in the world as a resource, until it finds the use value of something in nature and endows that something with economic value." Furthermore, this author claims that "innovation also represents everything that brings about changes in the wealth-producing potential of already existing resources" (Drucker, 1991, p. 55-56). The word innovation originates from the Latin word *innovare*, which means something new, renewal or change. In the relevant contemporary literature, there is agreement that the idea as the basis of innovation is an expression of creativity, but that it needs to be successfully applied in the business of a modern organization, to take root in the market, which leads to better business results. "Innovation is the first successful application of a product or process" (Cumming, 1998, p. 21).

3. CATEGORIZATION OF INNOVATIONS

There are various types of classification of innovations, in accordance with the criteria taken into consideration. Innovations can be categorized in several ways (Božić, 1996, p. 17):

- Innovations can be professional or amateur, in relation to the innovator, i.e. whether it is a professional research and development team, or the innovation is the product of an amateur innovator. Innovations most often arise as a result of organized research, which is carried out by teams of experts for research and development within companies, but in addition to them there are motivated groups of experts in smaller companies, as well as individuals in laboratories and scientific institutions, which are focused on introducing innovation. For example the first PC and many other important inventions, which reversed technological development, were created in unusual places.
- We differentiate between entrepreneurial and individual innovator innovations, with regard to the place of creation, i.e. innovations created in the employment relationship are taken as a criterion.

- Innovations can be divided by type, into inventions, i.e. innovations that are protected by a patent according to valid laws and regulations, as "know how" innovations that represent a set of knowledge and experience necessary to achieve a defined goal.

As already mentioned, innovations most often arise as a result of organized research. From a scientific point of view, innovation research can be focused on identifying the drivers of technological progress, analyzing the processes through which new knowledge is transformed into practical applications, and examining the conditions that enable the successful diffusion of innovations within society and the economy (Božić, 1996, p. 18). Innovative possibilities are found in the world around us, and even within ourselves. They represent changes that have already happened somewhere, or are yet to happen. Innovations are mostly used, that is, they arise as a result of some change, although they can also represent the change itself, which is a rarer case in practice. It is impossible to systematize the sources of innovation, because they represent an extremely broad and complex area. The only common feature of all of them is that there is essentially an innovative effort with a tendency towards effective and efficient change. It always starts from an idea, which needs to be identified and further developed, until its realization in practice. With their contribution, innovations always arouse great curiosity and attention of society and impose a real process of changes to which the environment needs to adapt, whether by acceptance or resistance. However, the most important sources of new ideas are based on the analysis of consumer requirements and preferences, then in companies, on the improvement of already existing solutions, in research and development processes in science, in distribution channels and the like (Mešanović, M., Čebić, A. & Abadžić, A., 2015). In theory, a frequently asked question is whether innovation should be subsumed under the concept of a scientific discipline, which uses the mechanisms of science in research into areas that are carriers of change? Do innovations represent the practice of entrepreneurship or the field of entrepreneurial theories (Sachwald, 2014)? When we talk about the sources of innovative opportunities, we can divide them into internal and external sources, considering the direction from which the potential for innovation develops. There are four internal sources of innovation opportunities. We can classify these sources as unexpected, incongruent, innovations that arise as a process need and as a result of changes in the structure of the economy or market (Drucker P. , 1996, p. 61).

4. INCONFORMITIES AS AN INNOVATIVE OPPORTUNITY

Discrepancies as an innovative possibility represent disagreement, disconfirmation, deviation between phenomena such as events, expectations, preferences, needs, requirements, production process, technology, product/service as well as market conditions. It is crucial to spot the inconsistency at the very beginning, while it is still hinting, in order to use it as an innovative opportunity. The elements between which there is a property of inconsistency are not easily observable, transparent, that is, they are not found in the reports or in the statistical data of a certain organization, but in the process of recognizing the "quality" of the reaction to them (Drucker P. , 1996, p. 75). Discrepancies as an innovative possibility can be reduced to a discrepancy between economic realities, then to a discrepancy between reality and assumptions about it, a discrepancy between perceived and real values and expectations of clients, as well as a discrepancy within the rhythm and logic of work (Zjalić, 2007, p. 179). If economic and market structures do not change over a long period of time, they will stagnate and decline. Although, at first glance, they appear as solid, consistent, stable, pre-set and given systems as a supporting part of the adopted order of relationships, processes, structures, they are also subject to changes due to interaction with the environment in which they are located (Drucker P. , 1996, p. 97-98).

Economic and market structures are fragile, and it often happens that a small change shakes them. In order to maintain them as stable, it is necessary to recognize the ability of structures to encourage change, and not to oppose it, which leads to destruction. Changes in the structure of the economy and the market represent a real innovative possibility, a chance for entrepreneurship as the main carrier of innovation. A large number of changes, unpredictable, complex and dramatic, both in the local and international environment produce new trends in thinking, new approaches to business management. The environment represents a set of social, cultural, economic, political and technological elements. The main characteristic of the modern environment is globalization, on the economic, political and cultural level. When analyzing the impact of the environment on the operations of a modern organization, the general and specific environment are taken into account.

5. INNOVATION MODELS

Modern approaches to innovation are based on organization, strategy and environment. The organization is connected to the environment through its strategy, i.e. its set goals and business concept, with which it responds to the demands of the market. A strategic approach to innovation is necessary in order to harmonize the possibilities and capabilities of the organization in accordance with the given circumstances. The business imperative of every modern organization is to acquire and maintain a competitive advantage and achieve long-term profitability, which implies the implementation of a specific model of the innovation process in business. There are several different innovation models, based on organizational changes and the structure of the organization itself. We distinguish linear-sequential, simultaneous, flexible and integrative innovation models (Cunha, M.P. & Gomes, J.F.S., 2003, p. 14).

1. Linear - sequential innovation models

The linear-sequential innovation model is represented as a conventional model of the innovation process. It is characterized by the following characteristics, which at the same time represent its shortcomings (Stošić, Innovation management as the basis of development, 2003, pp. 26-27):

- The innovation process is defined through stages, i.e. a series of "stage series", which are set independently of each other, between which there is no adequate interaction and feedback loop.
- Innovation activity is most often identified with the research and development sector
- within the organization
- The term "innovation" means only great discoveries, which entail radical changes, which is why this approach negates the significance of incremental innovations.
- Innovations are seen as isolated changes, not as an integral part of a wider system
- There are only product/service innovations or production process innovations

"Linear models do not predict the possibility that one of the phases can have a feedback effect on the previous phases, nor that the innovation process can include only some of the identified phases (from fundamental research for idea generation, through applied and development research, to commercial application). Thus, linear models distance themselves from reality, because it cannot be accepted that the complete cycle of innovation must always be completed in order to start the next process again, from basic research" (Stošić, 1999, p. 22)

6. SIMULTANEOUS INNOVATION MODELS

Simultaneous innovation models are adapted to a turbulent and dynamic environment in contrast to linear-sequential models. With them, as with the previous innovation model, the innovation process is based on a phased approach, but with the presence of interaction, adaptability and responsiveness to market pressure, reduction of the product life cycle and strong and intense competition. For this reason, this model has implemented processes that affect planning, a simple approach by eliminating unnecessary steps, shortening the time of realization of a certain phase, motivating and rewarding employees, and the like. In this innovation model, pre-development planning of the product is taken as a key, primary phase, so that the rationalization of the process is based on the elimination of delays and errors in this segment of the innovation process (Levi-Jakšić, M., Marinković, S. & Obradović, J., 2005).

7. FLEXIBLE INNOVATION MODELS

Flexible innovation models are a response to rapid changes and market uncertainty, which require the development of the ability to adapt and adopt changes, in the conditions of a turbulent environment. Flexible innovation models represent a driving force that can be used to achieve and maintain a competitive advantage on the market. When the flexibility of the innovation process is low, the costs of product modification are high and vice versa (Michie, J. & Sheehan, M., 2003, p. 125).

8. INTEGRATIVE INNOVATION MODELS

Integrative innovation models appear in the theory of organization in the seventies of the last century. From the aspect of innovation processes, they develop much later. (Gadrey, J., Gallouj, F. & Weinstein, O. , 1995, p. 4) Their starting point is presented as a relation of strategic management of innovation and technology, which harmonizes the business activities of the organization with the environment. This innovation model is best presented by the authors Kline and Rosenberg, through the well-known "chain-link" model, which emphasizes the uniqueness of the innovation process and the interaction of its components, where the importance of establishing effective links and feedback is insisted (Kline, S. J. & Rosenberg, N., 1986, p. 640). According to the integrative innovation model, innovation is viewed through the interaction between opportunities (chances), on the market side, and knowledge and abilities, on the organization side. Modern integrative models of product innovation management recognize the fact that the development of a new product or service requires a complex activity of collecting and using a large amount of information of a technical, financial, and market nature (Trott, 2005, p. 34). In this way, a chain of the innovation process is formed, in which the key connection of the invention phase, the research and development phase, and the marketing phase is presented. Continuity of these feedback loops is required at every moment of the innovation process. Contemporary entrepreneurship viewed as a socio-cultural phenomenon represents a set of ideas, talent, capital, knowledge and risk development. Entrepreneurship depends on human capital, that is, it represents the possibility of realizing human abilities in the economic sphere (Šehović, 2014, p. 155). The relevant literature points to the necessity of an innovative approach to business as a crucial element of entrepreneurship. Innovations and creations are an essential part of management, entrepreneurship and entrepreneurial activities (Wickham, 2001, p. 7). One of the most significant researches in this field was conducted by Joseph Schumpeter, on the basis of which the basic relationship between innovation, creation and entrepreneurship was established. In this way, a basis was provided for considering innovation as a necessary and often decisive factor for the development and success of entrepreneurship (Schumpeter J., 1982, p. 95).

In addition to individual abilities and the initial business idea, whether entrepreneurship will be successful or not depends on its environment, social and market, as well as on the organization of business activities itself. If the environment in which an entrepreneurial idea is developed motivates and supports a creative approach to business, the possibility of achieving efficient and effective business in the long term increases significantly. When we talk about entrepreneurship in contemporary business conditions, we primarily mean (Bešić, C. & Đorđević, D., 2009, pp. 101-110):

- Individual, external entrepreneurship is represented by one person, who is simultaneously the owner, manager and risk bearer or entrepreneurial group (eng. entrepreneurship). Individual entrepreneurship takes place on the market of small and medium-sized enterprises.
- Corporate, internal entrepreneurship is presented as new business units within large corporations. It operates in the market with limited competition and division of ownership, management and risk functions (eng. entrepreneurship). Corporate entrepreneurship is of great importance because it also affects the progressive development of individual entrepreneurship, through subcontracting units.

Business analytics in the modern environment is gaining more and more importance in the systematic formation of new internal business units. It can be organized in the form of an analytical creative service, which is responsible for responding to various environmental challenges through new, innovative solutions. It represents a means for identifying creative entrepreneurial decisions, that is, it decides whether it is more optimal to maintain the existing model of organizational transformation or to undertake a new entrepreneurial venture. Entrepreneurial analytics studies organizational transformation models that are designed to integrate information flows within the organization itself, observe and evaluate previously identified problem areas of business with the aim of turning them into a chance, i.e. a potential opportunity for business improvement (Arend, 1999).

9. CREATIVITY AND INNOVATION

In everyday speech, there is often an equal sign between the terms creativity and innovation. However, in a narrower sense these two concepts are differentiated from each other. Creativity represents the creation of new ideas, independent of their eventual realization, while innovation implies the transformation of these ideas into products or services that produce certain market effects. Creativity is the starting point for innovations, which are the result of applied creativity. Creativity can exist without innovation, while the opposite is not possible (Goldenberg, J. & Mazursky, D., 2002). Innovation represents the continuous improvement of products, services and processes within the organization. Innovativeness implies rationality and optimization of business processes as factors of increasing the efficiency and effectiveness of business. The process of creation of innovations consists of identification and definition of problems, generalization of possible solutions, i.e. incubation, discovery of the best solution, i.e. illumination, as well as their verification and implementation (Kottler, 1995, p. 33). Identification and definition of problems, or challenges as the first step of the innovation process, is a key segment of the creation of innovations. Basically, together with the problem, there is also a possibility for its solution, and precisely for this reason, a high level of concentration and a systematic, analytical overview of the given factual situation is required at this point. Formulated goals that are to be achieved through innovation are often taken into account, which enables a realistic assessment of advantages and disadvantages, that is, threats, chances or possibilities for the development of a new solution. The purpose of asking questions and researching the problem, i.e. its environment, is to obtain as much relevant information as possible (Kelley, T. & Littman, J., 2006).

9.1. Investments in new technologies

Modern business conditions are characterized by progressive technological development, increasing technological efficiency. Precisely because of this, organizations invest most of the realized profit in new technologies and equipment, in order to improve the production process, the product or its marketing. The position of the organization on the market is influenced by numerous factors of an economic-production, technical-technological and organizational nature. Therefore, in order to be able to talk about the development and progress of the organization, it is necessary to take certain steps, such as eliminating the causes of inefficiency, technical, technological and organizational backwardness, as well as implementing a strategy that strives for more efficient and effective business operations. In order to gain and preserve a competitive position on the market, organizations are obliged to constantly monitor achievements in science, technology and technology, which leads to changes in their organization (Levi-Jakšić, 2006). Drucker drew attention back in the seventies of the last century "that a company that is not able to launch an innovation when the circumstances demand it, is doomed to extinction, and its management is not up to its task" (Drucker P., 1996, p. 5). In the modern economic situation, it is very difficult to ensure continuous, economical and quantitatively significant and high-quality production, which requires an innovative approach to business in full. However, innovation alone does not guarantee success on the market. The failure rate of new products on the global market, depending on the economic branch, ranges from 30 to 80% (Levi-Jakšić, M., Marinković, S. & Obradović, J. , 2005). In order for a modern organization to achieve and maintain a competitive position on the market, it is necessary to work on improving management, improving the quality and properties of existing products/services, as well as introducing new products/services, strengthening innovation and the marketing function. (Levi-Jakšić, 2001)

10. THE ROLE OF THE CONSUMER IN THE INNOVATION PROCESS

The main dimension of successful business in modern market conditions is the satisfaction of consumer demands and preferences, that is, the main focus of the production process is based on the speed of placing the product/service on the market, as well as its quality. At this point, important questions are asked: Is there a real need for the product and/or service and has it already been recognized? Is the consumer ready to change his habits, and how to educate him about the innovativeness of the product/service?

One of the very common ways of developing and adopting ideas about innovations that would meet consumer expectations is learning through the use of existing products. The consumer, first of all, needs to have reliable information about the product offered to him on the market, so that through feedback and suggestions about the offered product, he becomes a partner in the innovation development process. In this way, the consumer, as the leading user, participates in the development process and is the first to accept a new product, which is in accordance with his specific needs and wishes (Mešanović, M., Čebić, A. & Abadžić, A., 2015). This type of cooperation with consumers is extremely suitable for organizations, because it directs them in the direction of development and improvement of products/services, which, by placing them on the market, fulfills the expectations of consumers, and thus achieves efficient and effective business. On the other hand, consumers are also motivated for this type of cooperation with the manufacturer because they expect certain advantages and benefits (Kostić-Nikolić, S. & Pavlović, V., 2006, p. 3).

11. INNOVATION AS A MEANS OF COMPETITIVENESS

In modern business conditions, the economy of knowledge comes to the fore, that is, information and technologies that provide modern organizations with the possibility of successful business and increased productivity. A new way of thinking about the organization of work and business was imposed, that is, the design model of the organization itself, as well as a wider connection with other segments of the economy. With a focus on the final product, organizations have directed their interest in building technological competence, as a critical success factor in modern business market conditions (Dixon, 2011). Today's technology encourages economic cooperation. By developing its own competencies, the company gets the opportunity to join the environment through business networks and alliances, which enables it to better distribute resources and exchange knowledge and information within the inter-organizational business structure. (Petković, M. & Aleksić Mirić, A., 2011, p. 580) Network connections among contemporary organizations oriented towards mutual cooperation, coordination and interests, provide a competitive position on the market much more easily. Power and responsibility in such network connections are distributed horizontally, and they come to exchange information, knowledge, experience and skills through better human connection, such as researchers and engineers with suppliers, scientific institutes and the like. (Herbert, 1984, p. 260) A new, flat organizational structure is created, which enables the exchange of professional staff and increased transfer of knowledge (Radović, D., Gavrilović, I. & Topalović, M., 2012, p. 273). Knowledge as a resource has a significant impact on all segments of the economy and society, at the national and global level. Today, the role of knowledge and knowledge management is becoming more and more important, posed as a key strategic issue of every modern company that is directed towards successful business and profit. Positioning the role of knowledge is considered the most important intellectual property, as the central function of a modern company, which provides a competitive advantage on the market (Porter, 1986, p. 13). The concept of innovation that was applied during the 20th century, i.e. the concept of closed innovation, meant that it was enough to establish a sector that deals with research and development within the organization. In order to talk about investing in development at all, it was necessary for previous innovations to prove profitable, to bring profit. It also happened that some innovations could be patented, but the corresponding requirements and possibilities of the market were awaited.

However, the model of closed innovation began to change in the nineties of the last century in accordance with the changes in the market that led to an increase in the mobility of educated staff, an increase in atypical employment, an increase in external interest in unused technologies and an increase in investment capital (Palner, 1987, p. 117). Today, the traditional, closed innovation approach has been overcome and replaced by an open innovation model, which represents the most reliable source of gaining competitive advantage. Large, developed organizations unite the research and development sector with other segments, and the importance of modern technology is especially emphasized. Large companies usually license innovations, which small companies can use as a patent, which contributes to the successful business of both.

12. INNOVATIVE MANAGEMENT IN HIGH-TECH ENTERPRISES

Innovative management is an integral part of an organization that, in its strategy, organizational structure, technological and personnel organization, contains an approach to innovation and change. (Afuah, Innovation Management, 2009, p. 11) In order to survive and further improve their business, i.e. to gain and maintain a competitive position on the market, these organizations implemented an innovative approach to their business activities, i.e. developed adaptability and flexibility.

Innovative management is achieved by companies in the fields of high technologies, which require radical changes in contemporary market conditions, work on the application of science and the development of applied research focused on innovative products. Typical branches of high technology, where such an approach is necessary for efficient and effective business, are, among others, biotechnology, the pharmaceutical industry and areas of computer program and software development. In order to achieve a successful operation of innovative management, it is considered that the key factors are related to its specific competencies, such as (Ettlie, 2000, p. 27-32):

- Innovations and innovative competencies
- Reliance on human capital and ideas
- Organizational factors that encourage adaptability and flexibility
- Strategic balance between efficiency, effectiveness and innovation
- High degree of strategic and technological integration
- Globalization.

13. CONCLUSION

Considering the circumstances of the modern environment, its complexity and unpredictability, organizations must constantly and continuously invest in innovations, in order to respond to changes and challenges as adequately as possible. One of the most important sources for gaining and maintaining a competitive advantage on the market is innovation, as a necessary prerequisite for efficient, effective and successful business. A good business idea, constant coordination and integration, application of modern technologies, but also knowledge, skills and experience on the basis of which innovation is realized and market effects are achieved. Based on an innovative approach, the organization provides the basis for further growth and development. It is especially necessary to keep in mind the constantly present and changing needs and expectations of consumers, as central dimensions of modern business. It is necessary to constantly offer consumers a better, improved, better quality, more functional, more visually attractive product or service, in order to achieve and maintain a superior and dominant position in relation to intense competition. The need for creative and innovative business activities is permanent and continuous. It represents the condition of economic success and development of a modern organization. Entrepreneurship as the main bearer of an idea is a suitable environment for the development of innovation. In Serbia, there has been increased activity on creating an environment for the development of entrepreneurship as a carrier of future economic growth and prosperity. Entrepreneurship as a way of doing business for small businesses is suitable for business development. This is particularly pronounced in ecology, which is a new way of business development in Serbia. Given that the concept of developing eco-products is present in the world, and awareness about it is still developing in Serbia, the analysis of eco-insecticides has shown that it is significant for the safety and health of people. Today, an ecological product is one of the most important elements in creating a successful brand. An ecological product must, in a global and integral system, maintain and support natural processes that provide conditions for the permanent maintenance of the planet Earth and its biological diversity.

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MACROECONOMIC CONSEQUENCES OF GROWING PROTECTIONISM AS EXEMPLIFIED BY THE US-CHINA TRADE WAR

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ABSTRACT

The world economy faces many uncertainties in 2025. Global trade conflicts may further intensify, geopolitical risks, especially the risk of war, will become more pronounced, and global economic growth may slow down. The beginning of Trump's second presidential term has brought more uncertainties to the future international economic and trade landscape. The differentiated economic structures and interests of Western developed countries have led to a certain degree of differentiation in the trends of their economic development. Asian countries generally have enormous growth potential. The expansion of BRICS has further increased their representativeness and increased their influence in global economic affairs. History tells us that if China and the United States work together, both will benefit; if they clash, both will suffer. Strengthening China-US cooperation meets the expectations of the whole world. For the world economy to achieve faster development, it needs a fair, open, transparent and rules-based world market. Without the cooperation of China and the United States, it would be difficult to form such a world market. International trade rules need to be constantly updated to adapt to changes in the world economy, and they also need guidance for China-US cooperation. New technologies and products such as artificial intelligence, biotechnology, and quantum computing are constantly emerging and being updated. In order to prevent and control potential security risks and ensure the peaceful use of technology rather than abuse, China and the United States must cooperate to establish relevant rules and order. There are no winners in a trade war and no way out for protectionism. The success of China and the United States will be an opportunity rather than a threat to each other. We hope that the United States and China will meet halfway, follow the direction outlined in the call of the two heads of state, uphold the principles of mutual respect, peaceful coexistence, and win-win cooperation, solve each other's problems through equal dialogue and consultation, and jointly promote the healthy, stable, and sustainable development of China-US economic and trade relations.

Keywords: trade war, protectionism, macroeconomics, customs, tariffs, quotas, USA, China

1. INTRODUCTION

A trade war is a diplomatic stance in which one country raises tariffs on imports from another country. It is also a way of discouraging buying from the international market and protecting the interests of traders from the country. A trade war is a side effect generated by protectionism, and therefore it is a pre-emptive economic policy of protecting producers from other producers by introducing tariffs, quotas on imports of goods, and subsidizing domestic producers. The expectations are that trade wars and protectionism stimulate industry in the country, protect national employment, reduce trade deficits, and at the same time fight against other nations in the global market.

Such a form of protection can be achieved by applying duties on imports, limiting quotas on the amount of foreign goods offered on the domestic market, and regulatory barriers such as

product classification and endless lists of prohibitions (Hass, R., Denmark, A. , 2020). The growing US trade deficit with China, caused by the position of the global leader in high-tech trade and with a large government deficit, Trump decided to implement a policy of protectionism to alleviate this situation. The trade wars between China and the US have further escalated and this is also a very important time in the development of global trade, which is shaped by historical events and contentious economic relations. The aim of this paper is to observe the consequences of US tariffs on Chinese goods and other trading partners of China.

2. THE IMPACT OF TRADE PROTECTIONISM ON THE GLOBAL ECONOMY

The limitation of international trade within the framework of protectionism is reflected in various forms of trade restrictions in international terms, including tariffs, quotas, subsidies and other non-tariff barriers. Such measures are primarily imposed to protect domestic industry from competition, and the aim is to limit the access of imported goods to the local market. In this sense, tariffs and quotas are the most common restrictive measures that a country imposes on foreign products. Tariffs are widely used as a means of protectionism and can take the form of specific or compound taxes. There is also the application of special tariffs according to the quantity of imported goods, such as a fixed amount per ton or unit. Ad valorem tariffs can be calculated as a percentage of the value of imported goods, and compound tariffs are a combination of both methods, with the addition of a fixed amount together with a percentage of the value. The price of imported goods rises when tariffs are imposed and thus becomes less competitive in that market. Consumers are then forced to opt for a more expensive local alternative, and foreign producers are faced with limited access to the market. These measures have the effect of tightening international trade relations, because they often lead to retaliatory actions by other countries.

2.1. Restrictive measures in protectionism

Quotas are also a means of protectionism, limiting the quantity of a particular good that can be imported, thereby helping domestic producers secure a larger market share. Unlike tariffs, quotas limit availability and do not increase prices, although they can lead to shortages or higher prices if local production does not meet demand at a given time. Subsidies are a more indirect form of protectionism. The government provides support and financial support to domestic producers, helping them to compete with foreign producers. Such subsidies can be direct, such as cash grants, or implicit, such as regulatory advantages. Although less confrontational than tariffs or quotas, subsidies can distort competition by giving local companies an unfair advantage, leading to market imbalances. Although they do not have immediate consequences, subsidies are often criticized for undermining the principle of free trade and harming global competitiveness (Xu, 2024). Implicit trade barriers are becoming a more popular tool of modern trade policy. They involve government regulation, industry standards, and subsidies, and they allow countries to protect their industries without openly defying a specific international trade agreement or risking retaliation. Implicit measures are favored because they provide more covert ways to achieve protectionist goals. For example, strict environmental or safety standards serve as a hidden barrier to foreign competitors by making it more difficult for foreign companies to meet such requirements. An example of such implicit protectionism is the US CHIPS Act passed in 2022. This law provides more than \$50 billion in subsidies to support semiconductor manufacturers. By offering large financial assistance to domestic companies, the US government aims to strengthen its position in the global semiconductor market. Subsidizing this industry gives US companies an advantage over competitors from other countries, especially in research and development (Xu, 2024).

2.1. Negative impacts of protectionism on a stable domestic economy

Although many protectionist policies aim to protect domestic industries, they can often have negative effects on the stability of the global economy. Such negative effects include disruption of supply chains, loss of consumer welfare, increased inflation in the home country, retaliation, reduced efficiency of the global economy, and negative (harmful) effects on developing countries (Lin, 2020). Protectionism can increase the price of imported raw materials, which can then be passed on to the production department, increasing their costs. Certain manufacturers have to look for alternative raw materials, which is both time-consuming and can lead to large losses. The US-China trade war has disrupted supply chains in many industries. As a result, companies can increase the price of their products, which puts high inflationary pressure on buyers. In addition, if a country decides to protect domestic companies, their competition from abroad is reduced. In this regard, they can maintain relatively high prices without worrying about losing market share. The China-US trade war has contributed to US buyers bearing the entire tariff without any burden on manufacturers (Amiti M, Redding S J, Weinstein D E. , 2019). This is particularly noticeable in industries such as automated manufacturing, which rely heavily on imported materials and involve high technological inputs. Protectionism can also harm consumer welfare by reducing product diversity. In addition, protectionism can provoke retaliation from the other side and can escalate into a trade war, escalating restrictions. International trade can become more difficult than before and affect the growth of the economies of both sides. If protectionism occurs not only in two countries, but in large numbers around the world, then the growth rate of the global economy could slow down, because it violates the principle of comparative advantage. This means that countries may no longer be able to benefit from specialized production and trade, and domestic companies are forced to produce what is relatively cheaper in other countries. Another important factor is the negative impact on developing countries. Many developing countries rely on exports based on comparative advantage to support their economic growth. If protectionism becomes commonplace, the first negative consequences would be for developing countries, as their exports would decrease due to reduced demand (Barattieri A, Cacciatore M, Ghironi F. , 2021). A decline in exports can slow down the economy. When demand falls, it can also cause companies to reduce the number of workers, which can directly lead to higher levels of unemployment and poverty.

3. OVERVIEW OF THE TRADE WARS BETWEEN CHINA AND THE USA

3.1. Key events in history

The current trade war between China and the United States can be traced back to various important historical events, especially during Donald Trump's first term. The administration of this US president marked a major shift in US foreign policy, which had previously been characterized by a sharp critical stance towards global rivals, primarily China and the European Union (Larres, 2020). While Trump once sought to engage with China, particularly in containing North Korea, his approach quickly turned confrontational when he launched a trade war against Beijing in late 2017 and early 2018 and imposed steep tariffs on Chinese goods. Such an aggressive economic strategy has been driven by Trump's growing dislike of China, which he has increasingly criticized throughout his presidency and viewed as a serious threat to U.S. economic interests. The consequences of such actions have extended beyond China-U.S. relations, as they have lacked the interest in maintaining a strong relationship with Europe and have led to a reevaluation of the transatlantic relationship by a number of EU states, who have come to see it as potentially unfavourable under the Trump administration.(Larres, 2020).

Based on this, such events not only contributed to the deterioration of China-US relations, but also significantly strained relations with the most important allies in the EU, which led to a significant weakening of relations between them because they did not agree with Trump's policies. As a result, history indicates that the trade war is intertwined with the wider geopolitical images that have arisen due to Trump's actions and rhetoric.

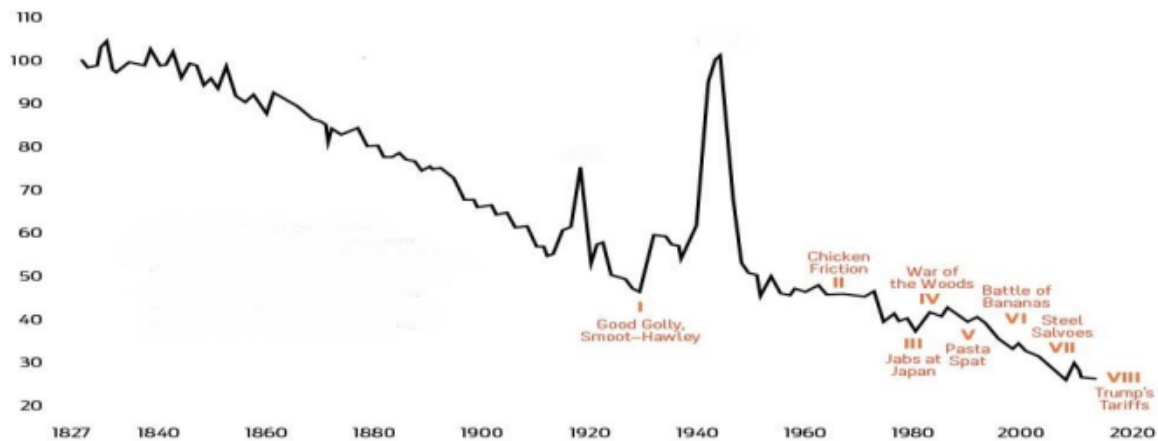


*Figure 1. 8 different trade wars started by the US and the latest trade war: Trump's tariffs
(Source: (Desjardins, 2018))*

Figure 1 shows the eight different trade wars that the United States has launched to date and the changes in average trade costs. Following the Great Depression, the United States increased import tariffs on 900 products by an average of 40 to 48 percent with the Smooth-Hawley Tariff Act of 1930. In subsequent periods, it continued its trade wars by taking emergency measures against imports seven more times. The trade wars have been followed by significant contractions in world trade. The most recent of these wars is the recent trade war known as the Trump tariffs. The products subject to these tariffs include steel, aluminum, agricultural products, automobiles, and some consumer goods. The United States has imposed additional tariffs of 25 percent on more than 800 products imported from China. At the same time, the EU has begun imposing additional tariffs of 25 percent on steel and 10 percent on aluminum coming from Canada and Mexico.

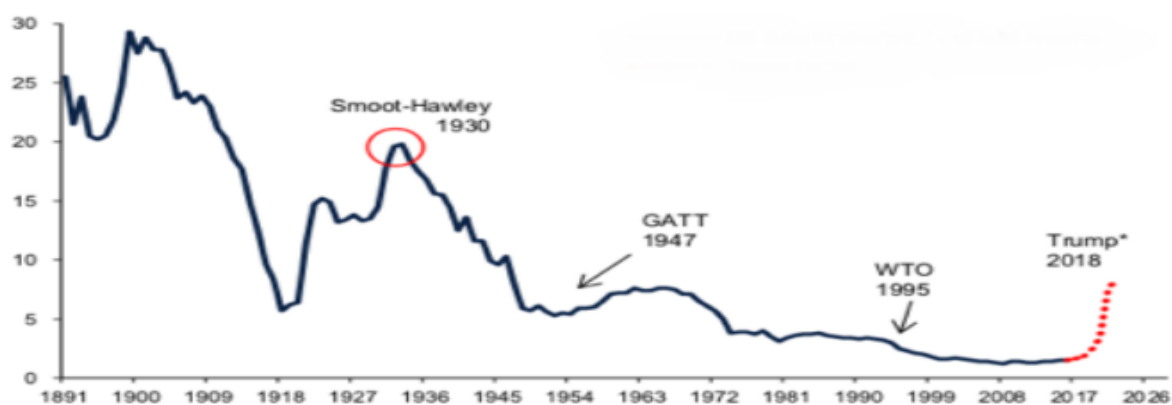


*Figure 2. Average tariff rates applied by the US
(Source: (MARCUM, 2018))*

Figure 2 shows only the tariffs applied by the United States for the periods 1891-2017. One of the striking points in the figure is that although customs tariffs were at their lowest level before the economic crisis of 1929, protective walls were raised again after the crisis. After the Great Depression, the United States started its first trade war with the Smoot-Hawley Act.

With the acceleration of post-war liberal policies and the establishment of GATT and the WTO, tariffs in the United States gradually declined and fell below 5%. However, the increase in tariffs by D. Trump led to an even greater increase in protectionism through tariffs. The radical changes in world trade that began with the election of D. Trump as president have caused uncertainty in the economic and trade policies of countries. Although the United States expects to benefit from the tariff wars it has launched, economic and commercial uncertainty is increasing across the country, which negatively affects the expectations of companies. Institutions such as the IMF, EPU and FRED have developed indices that calculate the uncertainty of countries' economic and trade policies. These indices give an idea of the current situation of trade and economy by showing the changes that many variables such as elections, policy changes, wars, trade conflicts, crises have caused to the economic policies of countries.

3.2. Chinese trade policies and practices and their impact on international trade relations

China's trade policies and practices significantly influence international trade relations and often intertwine economic goals with geopolitical strategies. As China's economic power grows, its ability to influence political decisions in other countries has become increasingly apparent, particularly through trade relations, using economic ties for political gain (Kastner, S., Pearson, M., 2021). For example, the Belt and Road Initiative is an example of China strategically using trade to expand its global influence while also serving the commercial interests of Chinese companies. However, such interactions are not without their difficulties; as in the case of Malaysia, leaders have warned against over-reliance on Chinese loans and highlighted the potential dangers of such economic ties, which could trigger a backlash (Kastner, S., Pearson, M., 2021). The dynamics of China's foreign economic policy are multifaceted, encompassing goals ranging from advancing foreign policy objectives to strengthening the national economy and promoting specific commercial interests.

This complexity suggests that China's trade policy is not driven by a single interest, but rather reflects a mix of interests that sometimes leads to misunderstandings about its true intentions, especially against a backdrop of global protectionist sentiment exacerbated by the 2008 financial crisis (Kastner, S., Pearson, M., 2021). Understanding these complex relationships and the impact of China's trade practices is key to responding to changing international trade. The economic impacts of trade wars, particularly the ongoing trade dispute between the United States and China, are profound and multifaceted, significantly altering the dynamics of trade for China and its global trading partners. While the United States and China grapple with the negative impact of rising tariffs, other countries see an opportunity to fill the void left by the two economic giants. For example, some countries are taking advantage of trade tensions to compete in the same markets that China and the United States currently find difficult to enter, with positive spillover effects for these countries (Masron, T. A., Nor, E., Subramaniam, Y., 2020). The trade war has had a major impact on the two countries' free trade agreement (FTA) partners, severely affecting key industries such as automobiles, electrical machinery and steel. (Singh, S., Sisodiya, S., 2021). In fact, China's strong export capabilities in these areas will benefit its free trade partners as they seek to improve their competitiveness in the global marketplace. By accessing markets in the United States and China that face tariff restrictions, free trade agreement (FTA) partners can improve their competitiveness and benefit from changing global trade patterns. This development highlights how the ripple effects of the trade war have spread beyond the major players and reshaped the global economic landscape.

4. THE EFFECT OF THE US-CHINA TRADE WAR ON GLOBAL MACROECONOMIC INDICATORS

Customs duties can be considered tariffs applied to all imported goods, which directly affect foreign trade and local consumers (Gordon, 2020). A tariff is similar to a general tax in that it covers a wide range of goods entering the United States. It affects the price of imported goods from producer to retailer. As a result, complex and diverse economic regulations are intertwined and reflected across sectors and regions, and the consequences of a trade war become even more complex. The impact of increased tariffs on American manufacturers is a double-edged sword. For example, high prices for imported intermediate inputs such as raw materials and components can further burden production costs (Chong, T. T. L., Li, X., 2019). This can lead to reduced profitability. Another factor to consider is that U.S. industries have higher production costs than their international competitors that are not subject to high tariffs. This could affect export-oriented industries by reducing the competitiveness of U.S. products. Amiti et al. The study found that all of the tariffs imposed by the U.S. on China in 2018 were passed on to the prices of goods imported into the U.S., while Chinese exporters did not lower their prices. As a result, commodity prices rose in line with the increase in tariffs at U.S. ports. The study also found that every 10 percent increase in tariffs would lead to a 43 percent reduction in import demand. Complex supply chains create major challenges in relocating exports and changing the origin of imports. As a result, many U.S. industries are tightly integrated into global supply chains and need help to quickly change production and trade routes. Since the various links in the supply chain are interconnected, from time to time there are some disruptions and it becomes difficult for the companies involved to adapt to the new trade reality. Add to this complexity the long-term agreements and relationships within the supply chains and change takes time. As already pointed out, at the beginning of Trump's last term, he achieved good results in stimulating economic growth by cutting taxes and relaxing regulations, but the trade war that followed objectively slowed down the US economic growth. Between 2017 and 2018, corporate investment in the US increased significantly, and consumer spending also showed an upward trend. During this period, the quarterly growth rate of US GDP once exceeded 4%. In 2019, as the trade conflict between China and the US intensified, US economic growth slowed down, and the GDP growth rate fell to 2.3%. In 2020, due to the impact of the new crown epidemic, the global economy declined sharply, and the United States was not immune. The economy shrank by 3.5% for the full year, the largest annual decline since 1946. This data shows that trade frictions have not helped the United States gain greater economic advantages, but have instead hindered the growth of the American economy. However, Trump's remarks after his re-election show that he still believes that trade protectionism is beneficial for the United States. In February 2025, Trump signed an executive order imposing a 25% tariff on imports from Canada and Mexico and a 10% tariff on goods from China. Trump is also trying to prevent Chinese goods from being exported to the United States via third countries by imposing tariffs on goods from more relevant countries. At the same time, he hopes to continue to strengthen the international status of the US dollar and states that targeted trade friction measures may be applied against the BRICS countries. In addition to the tariff measures, Trump and his team have threatened to terminate China's permanent status as a normal trading partner. If this move becomes a reality, it will have a more serious and far-reaching negative impact on Sino-US economic relations, and will have a non-negligible impact on many aspects of the two sides, including economic stability, trade exchange and industrial development. If all of Trump's threats are implemented, Chinese exports to the US could fall significantly, which would have a greater impact on Chinese export-oriented enterprises. Chinese electronics, mechanical equipment, consumer goods and other industries could be relatively more affected.

In addition, although Trump emphasizes the “America First” policy, the Biden administration’s strategy may also continue, using the influence of the United States to force allies to adjust their supply chain layout and try to further “de-sinicize”. This will pose a challenge to China’s manufacturing and foreign trade sectors, and will further encourage China to rely more on domestic demand and continue to pursue technological self-reliance. Just as during Trump’s first term, the overall resilience of the Chinese economy is reliable. Trade wars have a significant impact on major economies around the world. For the United States, if the trade conflict further worsens, its problems such as inflation, fiscal deficit and debt may become more pronounced. Trade conflicts could also have a significant negative impact on the economic development of the EU and Asia. In particular, the EU may be more negatively affected than the United States. This could push the global economy into recession. At the same time, the global trading system represented by the World Trade Organization may find it difficult to function effectively. The United States is currently the world's largest economy. In the early days of the Biden administration, he adopted a large-scale fiscal stimulus policy and a rapid vaccination plan, which led to the US economy growing at a high rate of 6.1% in 2021, the highest level in the United States in 40 years. The growth was driven by strong consumer spending and a recovering labor market. However, in 2022, US inflation quickly rose to a 40-year high, and the Federal Reserve was forced to adopt a policy of rapidly increasing interest rates. This move stifled economic growth, and the US GDP growth rate fell to 2.5% that year. In 2023, inflation eased somewhat, but the high interest rate environment and slowing global demand continued to slow economic growth, with GDP growth at 2.9%. According to the Federal Reserve, the annual growth rate of the US economy is expected to return to a range of 2.6% to 3% in the fourth quarter of 2024, and the annual growth rate of the economy will be around 2.8%. This growth rate will lead the developed economies of the world. In the first year of his last term, Trump used tax cuts and deregulation to stimulate economic growth with good results. In this term, Trump is likely to continue to use fiscal and monetary policy to stimulate the economy, but the overall debt burden of the United States is relatively heavy, so fiscal stimulus may not be too strong, and monetary policy has a lag effect. In addition, the implementation of immigration restrictions, such as tariffs, is likely to have a negative impact on US economic growth. Trump's emphasis on immigration issues is likely to lead the new administration to take stricter measures to restrict and deport immigrants, which will reduce the labor supply and affect the labor market and economic growth. Relevant reports predict that the US economic growth rate will remain around 2.5% in 2025 (Board of Governors of the Federal Reserve System, 2023). The EU is also an important global economy and its economic growth has a crucial impact on the global economy, but its overall economic performance is likely to continue to lag far behind that of the US in the coming year. According to the “European Economic Outlook” published by the European Union in November 2024, after a period of economic stagnation, the EU economy resumed growth in the first quarter of 2024, and GDP is expected to grow by 0.9% and 1.5% in 2024 and 2025, respectively. The EU’s economic recovery still faces many challenges. The current real disposable income per capita in the EU has increased. However, due to factors such as economic policy uncertainty, geopolitical risks and high inflation since the epidemic, consumer confidence in the EU and their willingness to spend have declined, resulting in a further increase in household saving willingness and saving rates. At the same time, household savings have not been flowing smoothly into corporate assets, and EU corporate investment has been low. The recovery in global trade in goods and services has given some support to EU exports. Various studies predict that its current account surplus will be 3.6% and 3.4% in 2024 and 2025, respectively. However, the uncertainty of international demand and the pattern of international trade make EU economic growth subject to many variables (European Commission, 2024).

Inflation in the EU is gradually easing, but there is still some pressure. Relevant reports predict that the EU inflation rate will be 2.6% and 2.4% in 2024 and 2025, respectively, which is a decline compared to the past. However, the economies of EU countries are greatly affected by fluctuations in energy prices, and current energy prices are highly uncertain (European Commission, 2024). Therefore, European inflation will also face pressure in the future. The EU unemployment rate is likely to fall further, and the good performance of the labour market is a reflection of the EU's future growth potential, but some industries and regions still face problems of employment imbalances. The EU's fiscal policy faces a dilemma between supporting a rapid economic recovery and maintaining debt sustainability. According to the EU's official forecasts, the fiscal deficit will be 3.1% and 3.0% in 2024 and 2025. (European Commission, 2024). EU fiscal policy needs to strike a balance between promoting economic growth and ensuring debt sustainability, while responding to the challenges posed by the heterogeneity of economic development across Member States. In this context, issues of fiscal policy coordination and cooperation are particularly highlighted. Despite the slowdown in global economic growth and rising geopolitical risks, Asian countries have continued to demonstrate their unique strengths and have become an important pillar of global economic stability with their strong economic resilience and growth potential. As the world's third largest economy, Japan is at the forefront of technological innovation, manufacturing and the green economy. Southeast Asia has become an important engine of global economic growth with its demographic dividend, growing middle class and relaxed trading environment. Japan's economic recovery has been driven by expanding domestic demand and a recovery in investment. The Japanese government's consumption stimulus policies have had a positive impact on industries such as tourism, retail and hospitality. After the epidemic, the Japanese government launched the "Go To Travel" tourism support project to provide people with travel subsidies, which has greatly boosted domestic tourism demand. Japan has also taken measures such as increasing investment in tourism infrastructure construction, promoting tourism, and optimizing visa policies to attract more tourists from abroad. According to estimates released by the Japan National Tourism Organization (JNTO), the number of tourists visiting Japan in 2024 will reach a record high of 36.86 million, which will have a significant boost to the local economy and employment. The recovery of investment in equipment is another key growth point for the Japanese economy. In recent years, Japanese companies have continued to increase their investment in high-end manufacturing, green technology, and artificial intelligence, with particular growth in investment in automobiles, semiconductors, and energy technologies. For example, thanks to the increase in global demand for hybrid vehicles, demand for Japanese cars has grown rapidly again. According to Marklines, the four largest Japanese automakers accounted for about 55% of global conventional hybrid (HEV) sales in 2023, and this share increased to 63% by the first quarter of 2024 (Marklines, 2025). Although Japan's economic growth is showing a good trend, it still faces multiple internal and external risks. First, geopolitical risks and global trade protectionism will affect Japanese exports. After taking office, US President Trump may protect the US auto industry through tariffs and other means, and the pressure on Japan's automobile-based export model is likely to continue to increase. Second, Japan's rapidly aging population has increased the pressure on its labor market and social security system. In the new year, Southeast Asian countries are likely to continue to be bright spots in global economic growth. The rapid economic growth of Southeast Asian countries stems from their strong domestic demand, good regional economic cooperation, and rapid development of the manufacturing industry. The expansion of domestic demand is an important driving force for economic growth in Southeast Asia. The rapid rise of the middle class in Southeast Asia has led to growing consumer demand. Take Vietnam as an example. Its retail and service industries have developed rapidly in recent years, and consumer demand for medium- and high-end products and branded products has increased.

Vietnam's tourism industry, as an important part of the consumption structure, has also performed well. According to relevant reports, Vietnam received 17.5 million international tourists in 2024, an increase of 38.9% over the previous year. The Vietnamese government has announced that Vietnam's tourism industry aims to receive 25-28 million international tourists by 2025, which will significantly promote the rapid development of Vietnam's domestic hotel, catering and cultural industries. Good regional economic cooperation provides new impetus to the growth of Southeast Asia and helps strengthen economic and trade vitality within and outside the region. Through the Regional Comprehensive Economic Partnership (RCEP), Southeast Asian countries have created a friendly and stable economic and trade environment for their trade and investment, thus gaining more development opportunities. Manufacturing is an important growth point for the economies of Southeast Asian countries. Southeast Asian countries have become a preferred destination for global production transfer due to their cost advantages and stable political environment. For example, the Vietnamese government has attracted multinational companies such as Samsung to establish several large-scale manufacturing bases by providing policies such as tax breaks and land subsidies for the production of smartphones and electronic components for export to countries around the world, while also encouraging the development of local supporting industrial chains. The economic growth prospects of Southeast Asian countries are optimistic, but there are some issues that deserve attention. First, inflationary pressures are exacerbating social inequality. Against the backdrop of global fluctuations in energy and food prices, inflationary pressures persist in some Southeast Asian countries, which may increase the cost of living for low-income people and further exacerbate inequality in the region. Second, uneven infrastructure development in Southeast Asia may limit further development of the regional economy. While Southeast Asia's demographic dividend and preferential policies are attractive to foreign investment, the relatively high costs of its transportation and logistics networks may raise some concerns for foreign investors.

4. CONCLUSION

Although the Sino-US trade war has not yet posed a major threat to both sides, and Trump's restrictive measures against China in the field of investment have been relatively restrained, the United States has positioned China as a long-term strategic competitor. Sino-US economic and trade relations are of great significance to both countries and have an important impact on global economic stability and development. Since the establishment of diplomatic relations between China and the United States 46 years ago, bilateral economic and trade relations have continued to develop. The trade volume between China and the United States has soared from less than 2.5 billion US dollars in 1979 to nearly 688.3 billion US dollars in 2024. The scale of Sino-US economic and trade cooperation has continued to expand and the level has continued to improve, making important contributions to the economic and social development of the two countries and the improvement of people's well-being. However, in recent years, the rise of US unilateralism and protectionism has seriously hindered the normal economic and trade cooperation between China and the United States. Since the Sino-US economic and trade disputes in 2018, the United States has imposed high tariffs on more than 500 billion US dollars of Chinese products exported to the United States, and has continued to introduce policies to contain and suppress China. China has no choice but to take strong countermeasures and resolutely defend its national interests. At the same time, China has always adhered to the basic position of resolving disputes through dialogue and consultation, has held multiple rounds of economic and trade consultations with the United States, and has worked hard to stabilize bilateral economic and trade relations.

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TRUMP'S VISION OF REALISM IN INTERNATIONAL RELATIONS

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ABSTRACT

The first half of 2025 is marked by tectonic changes in international relations as a result of the new - old US President Donald Trump taking office. His policy from the moment he took office and in the first 100 days was characterized by the destruction of the international order established on the basis of the liberal theory of international relations, after the First World War. The liberal theory of international relations, which includes liberal democracy, respect for human rights, the rule of law, the capitalist model of the economy and intensive international cooperation in multilateral forums, is now giving way to the theory of realism embodied in the foreign policy of the new US administration. The theory of realism in international relations, its scientific foundations, principles and applicability in international relations is part of the research of the author of this paper. Using the historical and comparative method, we point out the basics of realism, its most significant representatives and contemporary application, using the teleological method we point out the concrete actions of the new American administration in the application of its principles, including the postulates of neorealism and offensive realism. In the second part, the author points to the shock, disbelief and disagreement of Europe, especially the EU and its member states, with the new American realism, most briefly sublimated in the slogan "America Great Again".

Keywords: *theory of realism, international relations, international order, national interest, USA EU alliance*

1. INTRODUCTION

The first half of 2025 is characterized by profound transformations in international relations, following the inauguration of the new—yet familiar—U.S. President, Donald Trump. From the outset of his term and during the initial 100 days, his administration pursued policies aimed at dismantling the international order established in accordance with the liberal theory of international relations, which emerged after the First World War and maintained predominance for the past eight decades. This liberal framework—comprising democracy, human rights, the rule of law, a capitalist economic model, and robust multilateral cooperation including globalization—now appears to be yielding to realist theory, as embodied in the foreign policy agenda of the new U.S. administration. It appears that the implementation of the most conservative variant of realism is actively dismantling, nullifying, and interring the existing international order, thereby introducing a new landscape of anarchy, instability, and unpredictability in global affairs. The theory of realism in international relations—its scientific foundations, principles, and relevance to contemporary practice—constitutes a focal point of the present author's research. Through the use of historical and comparative methods, the study elucidates the fundamentals of realism, highlights its principal theorists, and examines its present-day applicability. Additionally, through the teleological method, the author identifies specific measures undertaken by the current U.S. administration that reflect key tenets of realism, including elements of neorealism and offensive realism. In the latter section, the author draws attention to the shock, disapproval, and dissent expressed by Europe—particularly the EU and its member states—in response to the emergence of this American realist approach, encapsulated succinctly in the slogan “America Great Again”.

2. REALISM AS A THEORY OF INTERNATIONAL RELATIONS

Historically, realism has constituted a prominent theory of international relations and a foundational reference for alternative and critical frameworks, offering explanations across eras for the essential features of international politics, particularly conflicts and warfare. In the twentieth century, critiques of liberalism's progressive and reformist optimism intensified, especially from the 1930s onward. Realist scholars draw upon a longstanding tradition of political thought, invoking figures such as Thucydides, Machiavelli, and Hobbes, whose analyses center on conflict and the dynamics of power (Chiaruzzi 2017, p.131). Machiavelli's insistence on moral standards for rulers distinct from those applied to individuals, aimed at safeguarding state survival, his focus on the pursuit and contestation of power, the presumption of politics as a struggle of interests, and his pessimistic assessment of human nature, all constitute foundational principles of realist theory (Machiavelli 2024). Although less frequently acknowledged, the intellectual genealogy of realism also includes Hegel's philosophy of law and his conception of the state's primacy. In his view, the state's supreme duty lies in its own preservation through an "individual totality" that evolves according to its internal laws and possesses objective reality. This objective reality is independent of its citizens and governed by moral standards distinct from, and superior to, those applicable to individuals. Realism maintains a normative and policy-focused orientation through its generalizations regarding state behaviour on the international stage. The evolution and proliferation of realist thought stem from its systematic critique of liberalism, particularly its assertion that norms of international conduct rooted in law and institutional structures are untenable without the nation-state serving as the central unit of analysis and action in world politics. Realist theory posits the absence of any inherent harmony of interests among nations, contending instead that nation-states frequently pursue divergent national objectives, some of which culminate in war. The capabilities of states are fundamental to the outcomes of international conflict and determine the extent to which one state can influence the conduct of another. Nevertheless, the concept of capability—or power—is seldom, if ever, regarded in realist theory as an exclusive explanation for war being the sole mechanism for resolving interstate disputes (Dougherty and Pfaltzgraff 1971, p.73). As sovereign entities and principal actors on the international stage, states pursue the maximization of both power and security. They constitute the foundational units organized according to hierarchical power structures, and their interactions shape the dynamics of global politics. From the perspective of realists and neorealists, the state is defined by three essential characteristics. First, states hold sovereignty, entailing the ultimate authority to create and enforce legal norms. Second, they possess a monopoly over the internal and external means of legitimate coercion, such as police and military forces. Third, states are territorially constituted, demarcating the global landscape and establishing both material and symbolic divisions among populations through constructs such as borders and citizenship. At the core of realism lies a distinct morality applicable to states, differing from the morality governing their citizens. The logic of realism in international relations assigns supreme moral value to the survival of the state and the protection of its interests. This supreme moral value legitimizes the violation of "secondary values" such as freedom and justice, as these are considered contingent upon the state's survival and reflect the doctrine of state reason. The reason of the state (originally *raison d'état* in French) is a specific political mode of thought that responds to necessity. Its foundation lies in the notion that politics is both autonomous and primary—that political reasoning, particularly when concerning vital interests or the state's survival, operates according to its own principles and logic, independent of moral or legal norms. State power is immanent in the condition of international anarchy, conceived as the natural state of international relations that shapes and constrains interstate behavior. Within realism, the struggle for power and pervasive insecurity can ultimately be resolved only by a hierarchical structure of dominance grounded in authority and subordination—that is, when world government supplants anarchy.

For realists, survival constitutes the most critical objective in international affairs, and fear emerges as a primary emotion essential for survival. Insecurity within the international system generates a security dilemma, wherein efforts to enhance one's own security increase the sense of vulnerability in other states. Consequently, a state's military measures, including ostensibly defensive ones, are likely to be mirrored by others, triggering a perilous spiral that paradoxically heightens insecurity for all. In essence, international anarchy is the origin not only of fear but also of inter-state hostility (Chiaruzzi 2017, p.149). Proponents of realism maintain that conflict between states is both inevitable and necessary within the realm of international relations. Depicting the international environment as inherently dangerous and unstable, the realist perspective holds that the use of force in response to external threats is legitimate, given that rational discourse and diplomacy are not always sufficient to dissuade a state or an alliance of states from resorting to violence. Each state seeks to survive independently, making critical decisions autonomously and ultimately relying solely on its own capabilities. As sovereign entities, states do not acknowledge any superior authority; nothing beyond the states themselves can restrain or challenge their use of force in interstate relations. Only through the mechanism of the balance of power can states, either individually or through alliances, counterbalance the power of other states. Most crucially, the balance of power safeguards the independent existence of states against threats, acts of aggression, and hegemonic ambitions. Realists regard the balance of power or force as the only genuine means of achieving collective security. Though conservative at its core, realism advocates the use of power as a tool to establish order and peace, rather than as an end in itself. The realist theory, as applied to U.S. foreign policy, draws upon the intellectual legacy of the founding figures of the American realist school of international relations after the Second World War, notably Hans Morgenthau and George Kennan. Morgenthau's seminal work *Politics Among Nations*, focused on the struggle for power in global politics, continues to be viewed as the foundational text of realism. He underscores the primacy of state power in defending national interests, considering this pursuit the most essential principle of international affairs, aligned with a nation's goals and needs. In the pursuit of power, domestic and foreign politics are reduced to three fundamental types: "Political action aims either to retain power, to increase power, or to demonstrate power." According to this view, all nations are compelled to defend their physical, political, and cultural identity from the encroachment of others. Consequently, the national interest becomes synonymous with national survival—meaning that state security is the foremost national priority. Once survival is ensured, the state may pursue subordinate interests. Morgenthau contends that states neglecting their national interest are but a step away from ruin. As long as the world remains divided into nation-states, Morgenthau contends that the national interest constitutes the ultimate principle in world politics. Interest, therefore, embodies the core of political activity. As famously expressed by Britain's Lord Palmerston: "Nations have no permanent friends or allies, only permanent interests." Morgenthau is concerned not only with the pursuit of power but also with the prerequisites for international peace. His understanding of international order is intrinsically linked to his notion of national interest. In the twentieth century especially, nations have replaced expansive global ambitions with more narrowly defined objectives essential to their national interests. Morgenthau asserts that rivalry among opposing states remains possible even within an international system devoid of ideologically driven foreign policies. He maintains that the balance of power constitutes the most effective method for regulating power. Yet, it is not the balance of power itself that ensures international peace, but rather the international consensus upon which it rests. Prior to the balance of power being able to impose constraints on states' pursuit of power through the mechanical interplay of rival forces, adversarial nations must first exercise restraint by adopting the balance of power system as a shared framework guiding their conduct (Morgenthau 1952).

George F. Kennan—former United States ambassador to Russia and Yugoslavia and professor at Princeton—demonstrates considerable alignment with Morgenthau. As a prominent realist, he affirms the core tenets of Morgenthau's perspective on the essential and preeminent role of the state in safeguarding national interests and amassing power within the international system. He rejects any conception of international relations that leads a nation to view its own objectives as inherently moral and those of its adversary as immoral. In his view, the incorporation of moralistic principles prompts nations to pursue unlimited objectives, embrace total war, and impose unconditional surrender upon defeated adversaries. In essence, adherence to moralistic doctrines proves incompatible with the pursuit of foreign policy aims that are fundamentally limited in scope. Kennan observes that the most critical shortcoming in U.S. foreign policy lies in its reliance on what may be described as a juridical-moralistic framework for addressing international issues. This framework reflects the belief that the turbulent and perilous ambitions of states can be reconciled through the acceptance of a universal system of legal norms and constraints (Kennan 1957). It is essential to consider the perspectives of one of the most prominent American diplomats, theorists, and practitioners of U.S. foreign policy, Henry A. Kissinger. He examined international relations through the lens of European diplomatic history and formulated two models: a stable system and a revolutionary system. He contends that stability does not result from the pursuit of peace, but rather from broadly accepted legitimacy. According to Kissinger's definition, legitimacy entails "international agreement on the nature of functional arrangements and on the permissible goals and methods of foreign policy." Legitimacy involves the acceptance of the international order's framework by all major powers. While consensus among great powers regarding the structure of the international order does not eradicate conflict, it does constrain its intensity. Conflicts within the framework are more restrained than those contesting the framework itself. Thus, he underscores the significance of devising limited war strategies in response to the challenges posed by nuclear armament and the dynamics of global politics. In his view, such an approach is essential to avert extreme outcomes—such as capitulation or annihilation—that could emerge from high-stakes confrontations. He maintains that the Atlantic alliance between the United States and Europe is vital for fulfilling allied objectives, as neither side is independently capable of effectively confronting threats and preventing the devastation that war may entail (Kissinger 1964). Within the theory of international relations, a distinction is also made between defensive and offensive realists. Defensive realists maintain that states operating within the international system ought to adopt a policy of restraint, as articulated by Kennan, whether in the military, diplomatic, or economic realms. Such defensively moderate objectives may be pursued without inciting excessive levels of mistrust among states and, more significantly, without the risk of unintended or uncontrolled escalation into counterproductive conflict. Conversely, offensive realists assert that occasional demonstrations of a willingness to engage in warfare—despite their short-term costs—can yield substantial reputational advantages over time. Their rationale is that increased power facilitates the acquisition of further power. In other words, conquest yields benefits. Consequently, states may engage in expansionist strategies aimed at enhancing their relative power positions, thereby intimidating and compelling potential adversaries to cooperate (Mingst and Arreguín-Toft 2017, p.80). Neorealism as a new theory emerges from the foundations of realism and the structure of power, rejecting the classical realists' claim that the internal character of states is a relevant factor in explaining the fundamental aspects of international relations. The term structural realism is frequently used to describe neorealism as a theory of international relations. According to Waltz, one of the foremost representatives of neorealism, war, alliances, the formation of the balance of power, and the instability of cooperation cannot be understood by focusing solely on the behavior of states individually and internally. States must be treated as empty boxes, as their internal arrangements and features are not of decisive importance for the international system.

For Waltz, it is the "structural anarchy" that fundamentally shapes state behavior in international relations, rather than internal composition (Waltz 1979, p.111). The primary function of the state is to seek and secure its own survival because no other actor can be relied upon to do so. This is due to the organizational principle of the international system—anarchy—from which emerges the necessity of "self-help" or self-reliance. In *The Tragedy of Great Power Politics*, John Mearsheimer argues that great powers are "always looking for opportunities to gain power over their rivals." According to him, great powers are rarely content and instead strive to expand their hegemony. This means that the ultimate concern of states is not just security but the maximization of power. Mearsheimer, for instance, examines how offensively oriented states may act as revisionist powers in response to structural constraints (Mearsheimer 2001). All of this suggests that realism is not a single theory, but a collection of various realisms that together form a broad tradition of thought marked by continual debates on the role of the state, power, security, and national interest under international anarchy. Though Mearsheimer shares many core assumptions with Waltz's theory of structural realism—or neorealism, often referred to as defensive realism—he differs in his portrayal of state behavior. The principal distinction lies in the degree of power that states seek. Mearsheimer argues that the international system's structure compels states to maximize their relative power and that in conditions of anarchy, the guiding principle is self-help. Furthermore, he maintains that all states possess offensive military capabilities and that considerable uncertainty exists regarding the intentions of other states. Consequently, Mearsheimer concludes that there are no content or "status quo" states, and each continuously seeks to increase power at the expense of others, with the most effective path to peace being the accumulation of superior power. Ideally, though he believes it is nearly unattainable, the ultimate goal is to become the global hegemon of the international system. Yet, since global hegemony is unattainable, he concludes that the world is condemned to perpetual competition among great powers (Dunne and Schmidt 2008, p. 220).

3. A LOOK AT THE NEW INTERNATIONAL RELATIONS OF THE USA THROUGH THE PRISM OF THE THEORY OF REALISM

The foundations of Donald Trump's new foreign policy, despite its chaotic and hard-line conservative character, fundamentally stem from the aforementioned principles of the father of realism. Historically, Trump's vision for a new international order traces back to the right-wing anti-communist movements of the 1950s, which conflicted with their Western allies over matters related to religious movements and harbored suspicions that American liberalism was excessively soft, overly post-national, and too secular to effectively safeguard US national interests (Kimmage 2025, p. 12). The fall of communism and the end of the Cold War led the United States to distance itself from using negotiations in international relations as a means to advance its national interests. Convinced that history had ended and that they could reshape the world in America's image, US presidents after this period increasingly relied on military and economic power as the primary instruments of foreign policy. When diplomacy was employed, it was typically not to enhance US power but rather to attempt the construction of a "global paradise" where multilateral institutions would supplant states and eliminate war (Mitchell 2025, p. 26). The oft-cited adage, "Nations have no permanent friends or allies, only permanent interests," regarded as the mantra of the realist school and the gospel of diplomats, appears to have been forgotten. This was exacerbated by the fluid interpretation of US national interest in foreign policy, which proved highly inconsistent, as different theorists and practitioners at various times used it to justify both American isolationism and pacifism on one hand, and interventionism and war on the other. According to hegemonic stability theory, international interest was equated with the American national interest, which was further expanded to encompass the promotion of free trade and the maintenance of open sea lanes (Thakur 2013, p. 95).

In his second inaugural address, Donald Trump pledged that the United States of America would once again lead the world, not by its ideals, but through its ambitions. With the pursuit of greatness, he promised, would come material power and the capacity "to bring a new spirit of unity to a world that was angry, violent and completely unpredictable" (BBC 2025). Thus, the national interest of the USA becomes the sole benchmark of future foreign policy, grounded in its most original form in Hans Morgenthau's theory of realism, which firmly rests on Machiavelli's postulates and the characteristics of the ruler. Consequently, the question of whether the national interest should override international law, or whether establishing and defending the rule of law in global affairs is itself a key element of American national interest, becomes irrelevant. Evidence of this lies in the first executive orders issued by the US president within fifteen days of entering the Oval Office, demonstrating the complete disregard for international law and its subordination to US national interests, even attempting to annul the rule of law within the domestic legal system cherished by US citizens. The apex of undermining the rule of law and the US constitutional system came later with his proposal to amend the US constitution to allow the president to serve three terms. It is clear that Trump, as a stubborn nationalist focused on power, profit, and unilateral gain, will never embrace the rule of law or the international order established after World War II. His "America First" platform continues to promote a fierce, all-encompassing nationalism directed at friends, foes, and everyone in between (Brands 2025, p.35). The first 100 days of Donald Trump's presidency are marked by a full application of Waltz's neorealist theory, particularly the notion that the internal organization of states holds no significance in international relations. Kimmage observes that with Trump in power and his allies in Beijing, Moscow, Ankara, New Delhi, and other capitals, there is a prevailing belief that no single system or agreed set of rules governs global politics (Kimmage 2025, p.20). Currently, US foreign policy assumes that bilateral diplomacy, balance of power, and agreements among great powers can serve US national interests far better than reliance on the complex framework of international cooperation embodied by the UN and other global organizations. Consequently, violations of international law have become normalized (for specific breaches of international law norms, see Gehring and Rao 2025). Notably, offensive realism appears to be resurging in this new policy framework, rooted in Mearsheimer's theories. According to Goddard, within Trump's updated balance of power strategy, Russia and China are regarded as "soul mates" tasked with curbing chaos and unsettling social changes in an anarchic world order. It is likely that the US will maintain trade competition with China, while Russia may be permitted to hold Ukrainian territory permanently to address Moscow's regional security concerns. There are also speculations that the US might consider ceding control of Taiwan to China, expecting in return that Beijing and Moscow would tolerate threats to the territorial integrity of Canada, Greenland, and Panama by the US (Goddard 2025, p.17).

4. EUROPE IN THE WHIRLPOOL OF TRUMP'S REALPOLITIC

In the new geopolitical vision of international relations crafted within the cabinet of the new-old US president, the already fragile concept of "the West" fades away, taking with it the status of Europe, which during the post-Cold War period, alongside Washington, embodied the "Western world." Since World War II, Europe developed a conditioned reflex to rely on American leadership and security guarantees, as well as an international order based on rules outside its borders (Kimmage 2025, p.21). The so-called "Atlantic earthquake," with its epicenter in Washington, did not spare Europe—that is, the EU and its member states. In disbelief and shock, European nations directly confronted Trump's policy during their first "close encounter" at the Munich Security Conference, where US Vice President J.D. Vance delivered a democracy lesson and declared a shift in the European alliance paradigm (Vance 2025).

Trump's new approach to the alliance with Europe is characterized by:

- Exclusion of European countries from negotiations on future peace in Ukraine and inclusion of Russia as a legitimate and equal partner;
- Withdrawal from the joint defense established within the framework of NATO, continued pressure to increase defense allocations while insisting on the purchase of American weapons, leaving Europe to finance its own security and waging war in Ukraine, prioritizing bilateral negotiations with European countries;
- An unequivocal display of territorial claims towards Greenland, leaving open the option for its annexation by the US by peaceful means or by force; Direct interference in internal affairs by supporting and favoring extreme right-wing political options with the proposal for Hungary to leave the EU;
- Contempt and mocking attitude towards Europe while emphasizing good personal relations and understanding with the presidents of Russia and China;
- Introduction of customs duties on products from the EU.

Europe has finally come to the realization that it no longer enjoys the support of its long-time ally, the United States, and that the current American administration openly displays hostility toward the EU. Consequently, Ukraine, as the first line of defense for Europe, has become an exclusively European responsibility when it comes to military and financial support. The involvement of Great Britain alongside EU member states in European security affairs represents an initial response to the disintegration of the US-Europe alliance. This new geopolitical shift also offers an opportunity for greater European unity and could accelerate the establishment of joint EU military forces, as outlined in the Common Security and Defense Policy under Section 2 of the EU Treaty. Accompanying this development is the urgent need for member states to increase their military budgets and assume full responsibility for their own defense, security, and deterrence of potential aggressors. Beyond financial commitments, the complex coordination between NATO, its members, and the EU poses a significant challenge. At the same time, Trump's foreign policy is seen by many in Europe as a catalyst for EU consolidation, particularly through the expansion of the EU to include the Western Balkans, Ukraine, Moldova, and by deepening relations with other European countries such as Great Britain, Switzerland, and Norway. In response to the imposition of 20% customs tariffs by the United States on EU products, the EU is actively redirecting its financial and economic activities, seeking new global partnerships (BBC News 2025). Economic cooperation is accelerating, especially following the signing in February of a free trade agreement with India, expected to take effect by the end of 2025. Further agreements with the UAE, Malaysia, the Philippines, and other countries are on the horizon. Through these efforts, the EU aims to position itself as a central hub in a global network of trade and cooperation—offering an alternative to the unilateral protectionism practiced by the United States (Balfour 2025).

5. CONCLUSION

The theory of realism in international relations encompasses various strands—neorealism, radical realism, and structural realism—all grounded in the fundamental assumptions about the state as the primary actor, the anarchic nature of the international system, and the legitimate pursuit of national interests for power acquisition. Realism emphasizes competition among states for military, political, and economic supremacy, including the use of force when diplomacy fails. The beginning of the US president's second term marked a renewed application of Trump's realist vision, closely aligned with classical realism's original tenets. With the US withdrawing from key international agreements and UN agencies, threatening the territorial integrity of Canada, Greenland, and Panama, pushing for peace in Ukraine through direct US-Russia negotiations, and imposing tariffs on goods from much of the world, the established international legal order faces significant erosion.

The emerging world order under this new US realpolitik—based on balance of power, a division of the globe into great power zones of influence, national interests as the sole legitimate objectives in international relations, and the potential use of force—fails to offer a compelling or stable alternative to the increasingly fragile and idealistic liberal order. Perhaps the most fitting conclusion comes from Hal Brands in *Foreign Affairs*: “You should probably be prepared for the world emerging in Trump’s second term to become a very dark place.”

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BORDER PROBLEMS OF SERBIA WITH SURROUNDING COUNTRIES

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ABSTRACT

Clearly defined borders are the foundation of the sovereignty of every state, because they play a key role in its political and economic development, as well as in its integration into the international community. The border problems that Serbia has with neighboring countries are not recent, but represent a long-term and complex challenge. In this paper, we will try to explain the causes of these problems, identify their forms and consider possible approaches to their mitigation or complete solution. Serbia's border disputes with neighboring countries have a multi-layered character and significantly affect political, economic and social relations in the region. The paper focuses on the analysis of key territorial disputes, their causes, consequences for bilateral relations and potential solutions, with reference to international legal standards and diplomatic mechanisms. Special attention is paid to territorial disputes with Kosovo and Metohija, issues of the rights of national minorities, trade barriers and migration movements. As part of the work, problems in relations with Montenegro, Bosnia and Herzegovina, as well as detailed disputes with Kosovo and Metohija will be discussed. The analysis provided includes territorial and administrative disagreements from a historical, legal and economic point of view, with the aim of a comprehensive overview of existing challenges. Using comparative analysis and relevant professional literature, the research indicates that stable and clearly defined border relations are the basis for improving regional cooperation and European integration. The paper also highlights the importance of dialogue and the application of multilateral approaches in overcoming conflicts and ensuring long-term stability in the Balkans.

Keywords: *Kosovo and Metohija, international relations, relations between Serbia and Kosovo, border problems of Serbia*

1. INTRODUCTION

Borders are not only geographic but also political constructs that define a state's sovereignty and its ability to act within international frameworks (Prescott & Triggs, 2008). In the context of Serbia, border issues remain one of the most sensitive and enduring political questions, especially in light of post-Yugoslav conflicts and changes. This paper aims to analyze the causes and consequences of border disputes and to offer proposals for their resolution. The paper will consider relevant theories on state borders, sovereignty, and international law. Special attention is given to the concepts of border disputes and their impact on economic development. Border issues represent a significant challenge in regional and international relations. Twenty-six years after the wars in the region, Serbia still faces unresolved border problems with many neighboring countries.

While the main challenge is EU accession, the issue of Kosovo and Metohija, as well as the insufficiently clearly defined state borders, remains one of the key problems Serbia continues to face. Border issues between Serbia and its neighboring countries represent a significant challenge in the context of regional stability, economic relations, and European integration. Borders have often been a subject of dispute due to historical, political, and ethnic factors, with unresolved territorial claims, minority rights, and trade barriers further complicating relations between the countries of the Western Balkans. These problems are not only the result of past conflicts but also a reflection of contemporary geopolitical dynamics and different approaches to resolving border issues. Understanding border problems and their adequate resolution is crucial for the long-term stability of the region. Therefore, this paper seeks to offer a comprehensive analysis of the current situation, identify barriers in the resolution process, and propose sustainable cooperation models that could contribute to strengthening good-neighborly relations and regional security. Territorial and border disputes between Serbia and other countries that emerged after the dissolution of the SFRY differ from case to case. Border demarcation was completed only with Macedonia, now North Macedonia, while Serbia still faces certain issues with its other neighbors, which affect many economic and political matters in relations between these countries. According to the paper by (Vukosav & Matijević, 2021) the border dispute between Serbia and Croatia along the Danube River arises from different geographic and legal interpretations of its course. After the dissolution of the State Union of Serbia and Montenegro in 2006, the border between the two countries was set according to the administrative line that existed within the former Yugoslavia. The border is mostly undisputed, but over time there have been technical issues related to exact demarcation in certain areas. However, at no point have there been serious political disputes regarding the border, and in practice, the border between Serbia and Montenegro functions without problems. The border is accepted by both sides, and any disagreements that existed have mostly been resolved through diplomatic negotiations. Border crossings are of great importance for Serbia, and as such, they are necessary due to: foreign exchange inflows, employment of new labor, income from leasing land and property, infrastructure connections, zonal services, and more (Kastrapeli, 1971).

The significance of clearly defined borders lies in (Bigo, 2002):

- Protecting against the entry of undesirable individuals (criminals and others who pose a threat) and others who do not meet the entry requirements;
- Protecting against the entry of goods that do not comply with state regulations, are restricted from entry, or are subject to customs duties;
- Preventing the smuggling of illegal goods and human trafficking.

The research methodology relies on the analysis of primary and secondary sources, including legal documents, historical records, and economic indicators. Additionally, a comparative analysis method was used.

2. LITERATURE REVIEW

The issue of border problems and territorial disputes in the Balkans has long been a subject of research in various academic disciplines, including international law, political science, economics, and security studies. Previous research has focused on the historical aspects of border demarcation, legal frameworks for dispute resolution, and the economic consequences of unclear borders. One of the key sources in the field of international law is the work *International Law* (Malcolm-Shaw, 2017), which provides a theoretical framework for analyzing territorial disputes and resolving border issues through mechanisms such as international arbitration and bilateral agreements.

Additionally, studies (Weller, 2009) on territorial disputes in the Balkans offer deeper insights into the legal and political aspects of border demarcation in post-conflict societies. In the context of political analyses, significant works include (Bieber, 2011) and (Jović, 2009), which explore the impact of ethnic and historical factors on border tensions in Southeast Europe. Their works indicate that unresolved border disputes are often linked to the rights of national minorities, such as the cases on Serbia's borders with Croatia, Bosnia and Herzegovina, and Kosovo. The economic perspective on border issues is illuminated by the research of (Szent-Iványi, 2017) and his studies on cross-border economic cooperation in Southeast Europe. His analysis shows that unclear borders and political tensions can negatively impact trade, foreign investments, and infrastructure projects, while European Union initiatives, such as the Interreg funding programs, are crucial for enhancing cross-border cooperation (Interreg EU, n.d.). In addition to academic sources, studies from international organizations such as the Organization for Security and Co-operation in Europe (OSCE) and the European Commission provide current data and analyses on border disputes and political initiatives aimed at resolving them. Documents such as the European Commission's annual progress reports on Serbia's EU accession process offer insights into institutional barriers and recommendations for resolving these issues. Based on the review of relevant literature, it is clear that Serbia's border problems with neighboring countries are multidimensional, and their resolution requires a multidisciplinary approach. Previous research provides a foundation for analysis, while also highlighting the need for further investigation of specific cases, especially in the context of contemporary geopolitical changes and European integration.

3. MATERIALS AND METHODS

The research is based on qualitative methods that encompass the complexity of Serbia's border issues. Content analysis was used by examining secondary sources to address the legal, political, and economic aspects of border disputes within both theoretical and empirical frameworks. The literature review includes the use of journals, conference proceedings, books, and other relevant sources to investigate the importance of quality in the context of products and services. To identify relevant literature, databases such as Google Scholar, ResearchGate, Scopus, and Kobson were used. The empirical research represents a methodological approach based on direct observation and experience, with data being systematically collected and analyzed. This type of research allows for the acquisition of empirical evidence that helps answer research questions and draw conclusions about natural or social phenomena. Primary sources used in the study include international legal documents, national laws and regulations related to border regimes and cross-border cooperation, and reports from international organizations analyzing border disputes and their impact on regional stability. For the purposes of this research, content analysis was used to study legal documents, international agreements, and political reports to determine the key legal frameworks and political factors affecting the resolution of border issues. This multidisciplinary approach enables a comprehensive analysis of Serbia's border problems and the identification of possible solutions that could contribute to regional stability and the enhancement of cross-border cooperation.

4. CRITERIA FOR SELECTION

In selecting relevant literature and research methods, several criteria were taken into account. Sources and data had to be directly related to the topic of Serbia's border problems with neighboring countries, including legal, political, economic, and social aspects. Only peer-reviewed papers, books by reputable authors, reports from international organizations, and data from relevant databases such as Scopus, Web of Science, ResearchGate, and Google Scholar were used.

Priority was given to sources published in the last ten years, though older sources of particular importance for understanding the historical context were also considered. The focus was on works published in scientific journals, conference proceedings, legislative documents, and official reports, ensuring the reliability of the sources. Furthermore, the research was based on clearly defined methodological approaches, including analyses and empirical data. Given the complexity of the topic, sources from international law, political science, economics, and security studies were considered, allowing for a comprehensive approach to the analysis of border problems. These criteria ensure the scientific grounding and credibility of the research.

5. KEYWORDS

The study utilizes specific keywords and search terms related to: Kosovo and Metohija, international relations, Serbia-Kosovo relations, Serbia's border problems.

6. RESEARCH QUESTIONS

1. What are the most significant border problems between Serbia and neighboring countries, and how do they shape economic development and regional stability?
2. What are the main causes of contemporary border issues between Serbia and its neighboring countries?
3. How can solutions be applied to resolve Serbia's border issues with neighboring countries?

7. PROBLEMS OF SERBIA WITH NEIGHBORING COUNTRIES

Border disputes in the Western Balkan region are mainly the result of the breakup of the former SFRY and inadequately conducted demarcations. In the case of Serbia, the most significant issues include: the status of Kosovo and Metohija (Weller, 2009), the border with Montenegro (Pavlović, 2016), and relations with Bosnia and Herzegovina, particularly concerning the border along the Drina River. Serbia faces numerous border challenges, especially in its relations with Bosnia and Herzegovina, including unresolved issues along the Drina River, the Bajina Bašta and Zvornik hydroelectric plants, the Belgrade-Bar railway, as well as border crossings. Problems also persist with Kosovo, including entry bans, tariffs on goods from Serbia, fiscal barriers, economic and security challenges, as well as unresolved issues related to property, resources, and migration. Additionally, open questions remain regarding environmental protection, land use, human trafficking, lack of tourism offerings, and tax misalignments. Clearly defined borders are essential for stable economic development as they enable more efficient flow of goods and services, stimulate investments, and improve bilateral relations. The development of border zones should be aimed at attracting direct foreign investments, increasing employment, strengthening exports, and creating regional logistics centers. This supports the liberalization of trade and the financial sector, while also enhancing the knowledge and skills of the domestic workforce.

8. BORDER ISSUES WITH KOSOVO AND METOHIJA

The territory of Kosovo and Metohija holds a deep historical connection, with the myth of the sacred Serbian land, the Battle of Kosovo, the Nemanjic dynasty, Prince Lazar, and the Kosovo heroes, which have found an everlasting place in the inspiration of Serbian creators. National symbols, traditions, and customs evoke strong emotional sentiments that reflect cultural identity. Kosovo and Metohija are also a multiethnic and multireligious space, where today, two completely separate cultures exist and have developed in parallel for centuries.

If we accept the thesis of American sociologist Huntington (Huntington, 1993) on the "clash of civilizations," and (Ksavijs, Halpern & Ruaono-Borbalan, 2009), we could interpret the relationship between Orthodox and Muslim civilizations in a single space. The border issue between Serbia and Kosovo remains one of the most sensitive challenges in the region. Although Kosovo declared independence in 2008, Serbia does not recognize this decision, and the border remains undefined, causing tensions, particularly in areas with Serbian populations. Key issues include the status of the administrative line, minority rights, and the role of international organizations. The Preševo Valley stands out as a potential point of territorial exchange or autonomy within the dialogue between Belgrade and Pristina. Resolving this issue would have a significant impact on regional stability, especially concerning the position of Serbs in northern Kosovo. At the beginning of the 1990s, global political changes significantly influenced the border issues of Serbia and its neighbors. The collapse of the USSR, under internal tensions, allowed former socialist states to leave totalitarianism and move toward democracy (Goati, 1996). With the disappearance of the bipolar world order, the USA assumed the role of a global arbitrator, often intervening in crises—sometimes applying double standards and force instead of law (Goati, 1996). The changes in the global political order profoundly disrupted the internal balance in Yugoslavia, questioning the survival of the communist system and opening space for the redefinition of borders. Western powers, particularly the USA, encouraged political reforms and the transition to democracy, while national antagonisms in Yugoslavia grew faster than democratic processes (Mujović, 1995). After the violent breakup of Yugoslavia in the 1990s, efforts were made to build lasting peace and a stable Balkans. Reconciliation became a key challenge, burdened with deep traumas, disrupted identities, and the dangers of new conflicts, which required a thorough reassessment of barriers to true reconciliation (Nakarada, 2011). Besides political influence, religion played a crucial role in worsening the conflict in Kosovo. The Serbian-Albanian conflict further exacerbated the old confessional divide between Muslims and Christians (Davison & Roderic, 1973). Ethnic divisions became more important than religious ones, but religious differences still shaped these divisions. Within religious communities, ethnic differences became even more pronounced, and collective identity, which had transcended ethnic lines, weakened before the breakup of Yugoslavia, leading to the fragmentation of church organizations (Pavlowitch, 1998). Aggressive Albanian politics found its organized form in the establishment of the League of Prizren in 1878, whose main goal was liberation from Turkish rule and the unification of all territories considered Albanian (Bogdanović, 1986). After the liberation of Old Serbia in the Balkan Wars and the formation of the Kingdom of SHS, the political and social conditions for Serbs in Kosovo and Metohija improved. However, terrorist activities of Albanian bandits continued until 1924. Between the two world wars, fascist occupation of Kosovo replaced what was considered a peaceful period, while the Second Prizren League was held in 1943. After 1945, power in Yugoslavia was taken by the Communist Party of Yugoslavia (KPJ), which continued the policy of forcibly expelling Serbs from Kosovo and Metohija, using violence and political pressure, particularly since 1966 (Avramović, 2007). Estimates suggest that between 200,000 Serbs permanently left Kosovo and Metohija from the 1960s to 1981. The establishment of the University of Pristina in 1971 brought 240 professors from Tirana, with textbooks in Albanian that carried a mix of nationalism and Marxism (Trifković, 2003). Gosijo emphasizes that Kosovo was not only a religious issue but also a key element in the broader Serbian question. "Defending Kosovo meant defending all Serbs, defending the Kosovo legacy" (Fransoa-Gosijo, Halpern & Ruaono-Borbalan, 2009). After the 1974 Constitution, Albanian national ambitions, particularly among the youth, escalated. A year after Tito's death, the Albanian minority demanded that Kosovo become a republic with the right to "self-determination to secession," leading to brutal conflict and NATO aggression in 1999, under the pretext of stopping violence (Trifković, 2003).

The consequences were severe: the withdrawal of Serbian institutions, the loss of 1,500 Serbian lives, the disappearance of the same number of people, the expulsion of 250,000 Serbs, and the destruction of 150 churches and monasteries. Kosovo's unilateral declaration of independence in 2008 triggered divided opinions at the international level. According to data from March 2025, Kosovo has been recognized by 105 UN member states, accounting for 54.4% of the membership, while a report from December 2024 cites only 83 recognitions.

These differences highlight the dynamic process of international recognition (Ministry of Foreign Affairs of Serbia, 2021). Academician Marković believes that Kosovo's fate will depend on European history, as well as our ability to defend Serbia's territory, crucial for the identity of the Serbian people (Marković, 2021). Zurovac emphasizes that the survival of the Serbian people is seriously endangered. The problems with the administrative line between Kosovo, Metohija, and Serbia stem from the political process that began after Kosovo's declaration of independence. Conflicts in this region had the character of armed struggles, and the military-strategic importance of the area complicated the demarcation agreement. While the issue with Macedonia was resolved, Pristina remains concerned about the Cepotina military base in Serbia. In unresolved cases, such as the situation with Small and Great Školj, there is a fear of endangerment the ecosystem due to the potential construction of a port.

8.1. Territorial and Political Dispute with Kosovo

The border issues with Kosovo and Metohija remain a key challenge in Serbia's foreign policy. After Kosovo declared independence in 2008, which Serbia did not recognize, the border between Kosovo and Serbia became a subject of dispute. While some agreements have been reached, such as the Brussels Agreement in 2013, the real issues persist, including the status of the territory, the autonomy of the Serbian community, and Serbia's recognition of the border. Political decisions that do not align with the agreements, along with ethnic tensions and violence in northern Kosovo, complicate the situation. Many countries, including the EU, recognize Kosovo, which further complicates negotiations.

8.2. Economic and Security Issues

Unresolved border issues negatively impact bilateral relations, economic flows, and European integration, causing uncertainty regarding minority rights, freedom of movement, and cross-border cooperation (Bieber, 2013). The borders between Serbia and Kosovo hinder trade, transport, and the movement of people, as Kosovo is not part of the Schengen Area, slowing down economic cooperation. The border infrastructure is inefficient, with high customs duties. The security situation, especially in northern Kosovo, where the Serbian minority resides, often becomes a challenge for international missions.

8.3. Impact of the International Community

The international community, particularly the EU and UN, plays a crucial role in resolving the border issues between Serbia and Kosovo. The EU mediates in dialogues and negotiations, while the UN is present through the UNMIK mission, tasked with helping maintain stability in Kosovo. However, in practice, the presence of international actors has not always been sufficient to ensure long-term stability. Over the last few years, changes in the international political climate, as well as increased interest from major powers such as the United States and Russia, have further complicated the negotiation processes, leading to various foreign policy pressures on both sides.

8.4. Regional Impact and Neighboring Relations

Although the border issues with Kosovo and Metohija are primarily a bilateral challenge between Serbia and Kosovo, they also have a regional character, particularly in the context of Serbia's relations with Albania, Montenegro, and North Macedonia. For example, Kosovo's independence has affected Serbia's relationship with Albania, which recognized Kosovo as a sovereign state. This creates difficulties in building mutual trust, both politically and economically. Similarly, Kosovo's northern border with Montenegro and North Macedonia has created certain geopolitical tensions, as the status of Kosovo directly impacts political relations with these countries.

8.5. Challenges for Local Communities

For Serbian communities in Kosovo and Metohija, border issues have a significant impact on daily life. Some of the most important challenges include freedom of movement, employment, and access to education and healthcare. Furthermore, the constant uncertainty surrounding the borders often leads to an increased fear of violence, which further multiplies the emotional and social distance between Serbs and Albanians in Kosovo.

9. WAYS TO RESOLVE THE PROBLEMS IN KOSOVO AND METOHIJA

Since 1999, Serbs in Kosovo and Metohija have faced continuous violence, ethnic cleansing, and discrimination, while international governance has failed to provide adequate protection. A sustainable solution to the issue of the return of 60% of displaced Serbs lies in ensuring normal living conditions and preserving multiethnicity. A key step is the legal definition of the constitutional status of Serbs, with guarantees for their rights and freedoms. The decentralization process, with the formation of a Serbian entity in Kosovo, would provide institutional autonomy, covering cultural preservation, healthcare, local economy, and security. It is essential to guarantee all Serbs in Kosovo and Metohija the right to preserve their national identity, including the use of the Serbian language and script, education in the Serbian language, and the nurturing of culture and traditions. Additionally, border challenges need to be addressed, including the establishment of clear administrative protocols for border crossings, improving infrastructure, and increasing the number of police officers. A critical step in resolving border crossing issues is strengthening the dialogue between Belgrade and Pristina, as well as fostering international dialogue under the auspices of international organizations. Integrated Border Management (IBM) can contribute to reducing political tensions, improving infrastructure, and establishing special regimes for the transportation of goods (Reljić & Bieber, 2019).

10. RESULTS

Based on the research, it can be concluded that improving regional cooperation, harmonizing regulatory frameworks, and strengthening institutional support are essential to reducing the negative effects of border issues and enhancing the economic development of Serbia and its neighbors. Although Kosovo is recognized by a significant number of countries, it faces considerable challenges in achieving full international legitimacy, particularly due to the opposition of major world powers such as Russia and China. Mechanisms such as the European Union and the United Nations can play a crucial role in encouraging dialogue and achieving long-term solutions for border and territorial disputes. Furthermore, continued legal and political support for Kosovo's international recognition could contribute to regional stabilization and the normalization of relations between Serbia and Kosovo. These results indicate that stability in the Balkan region, including the resolution of border and territorial disputes, is of crucial importance for long-term peace and the European integration of the countries in this part of the world.

11. LIMITATIONS OF THE STUDY

The research "Border Problems of Serbia with Neighboring Countries" faces several limitations that impact the scope and interpretation of the results. Key limitations include restricted access to data, as some information about diplomatic negotiations and border incidents is not available or is confidential. Additionally, the analysis relies on sources that may be subjective, which affects the objectivity of the research. The variability of political and economic factors, as well as the geographical specifics of the problem, can further influence the relevance of the results. The lack of deeper empirical research and the limited time frame of the study also reduce the detail and depth of insights into specific challenges. Despite these limitations, the paper provides a significant contribution to understanding Serbia's border problems, identifying key challenges, and offering possible recommendations for resolution.

12. DISCUSSION

The border problems of Serbia with neighboring countries, with a particular focus on Kosovo and Metohija, represent a central issue in the geopolitical relations of the Balkans, but also in the broader European context. The situation in this region is especially complex due to historical, political, ethnic, and international factors that shape the border between Serbia and Kosovo, as well as influence relations with neighboring countries. The issue of Kosovo, while encompassing a broader international framework, has deeply rooted local consequences that extend through all aspects of Serbia's border relations with Albania, Montenegro, and North Macedonia.

RK 1: Key border issues the most important border problems Serbia faces with its neighboring countries include border status, unharmonized customs and administrative procedures, and political disagreements. Examples include:

- Kosovo and Metohija - Disputes over the status of Kosovo, non-recognition of Kosovo's customs stamps, exclusion of the dinar as a payment currency, and political blockages have created economic uncertainty, hindering trade and transport.
- Bosnia and Herzegovina - Issues with customs procedures and disagreements over infrastructure ownership slow down regional economic cooperation.
- Montenegro and Croatia - Although relations are more stable, disagreements over minor administrative matters and infrastructure also slow down economic flows.

These border problems impact economic development by increasing business costs, slowing transport, and creating uncertainty among businesses. Regional stability is also threatened, as unaligned borders and misunderstandings between neighbors can increase tensions and reduce trust, which is crucial for long-term economic plans and investments.

RK 2: The challenges of border agreements although numerous bilateral border agreements have been signed, their full implementation is often lacking. Disputes such as those over the Danube River (with Croatia), Sutorina (with Montenegro), or parts of the border with Bosnia and Herzegovina reflect the absence of final agreements and effective demarcation. The presence of geopolitical interests of major powers (USA, EU, Russia, China) further complicates the resolution of border issues. The varying levels of support these powers provide to Serbia and its neighbors affect the course of negotiations, territorial recognition, and bilateral relations. The most challenging and complex border issue concerns Kosovo and Metohija, which declared independence unilaterally in 2008. Serbia does not recognize this and considers it an integral part of its state territory. This issue creates international tensions and generates institutional, legal, and security challenges on the ground.

RK 3: Steps toward long-term stability key steps toward long-term stability in the region include finalizing legal border demarcation, continuous dialogue with Pristina with clearly defined goals and protection mechanisms, and greater involvement of international organizations in mediation and monitoring. At the same time, enhancing regional cooperation through joint economic and infrastructural initiatives, improving institutional protection of minority rights, and promoting intercultural dialogue and understanding are key factors in building mutual trust among the countries of the Western Balkans. Additionally, aligning Serbia's foreign policy with the norms and principles of the European Union could significantly contribute to its international reputation and accelerate its path toward European integration. In this light, border and political disputes should not be seen solely as obstacles, but also as opportunities to strengthen regional stability, security, and sustainable development.

13. OPEN QUESTIONS

Although the research has illuminated key aspects of the border relations between Serbia and Kosovo, numerous questions remain unresolved and present a challenge for future research and political practice. Particular attention is required for the long-term implications of a final resolution of Kosovo's status on regional stability, as well as opportunities for building lasting trust between communities. Additionally, there is a need to consider ways to improve the efficiency of international aid, resolve the status of ethnically mixed territories, and remove obstacles to sustainable economic cooperation. The issue of integrating the Serbian community in areas such as education, healthcare, and property rights remains crucial, while the potential recognition of Kosovo emerges as a key question in the context of Serbia's European integration. Finally, security challenges and migration management along the administrative line require coordinated and long-term approaches to ensure the stability of the entire region. These questions point to the complexity of the issue and the need for multidisciplinary cooperation to achieve sustainable solutions. While some of these issues may currently be unsolvable, opening dialogues and seeking constructive responses can contribute to the process of reconciliation and stabilization.

14. CONCLUSION

Border disputes have far-reaching consequences for political stability in the region, international relations, and economic development. The legal framework includes international conventions and bilateral agreements, while the economic dimension involves the impact on trade flows and foreign investment in the affected areas. Border problems with Kosovo and Metohija represent the most complex and significant challenge for Serbia, requiring long-term diplomatic efforts, improved security situations, and strengthened regional cooperation. Although the dialogue between Belgrade and Pristina has made some progress, full normalization of relations and a permanent resolution of border status cannot be achieved without comprehensive political, security, and social reforms. In this context, key steps include building mutual trust, intensifying cooperation with international actors, and providing continuous support to the Serbian community in Kosovo to protect their rights and security. The analysis shows that border problems are deeply rooted in historical and political circumstances, and their resolution requires a combination of bilateral negotiations, international arbitration, and legal mechanisms, supported by initiatives that promote regional stability and cooperation. The border problems between Serbia and Kosovo and Metohija represent one of the most complex and sensitive issues in the Balkans, rooted in deep historical, political, ethnic, and security challenges. Their impact goes beyond bilateral relations between Serbia and Kosovo, expanding into a regional and geopolitical context.

Despite some progress made through dialogue and international negotiations, many key issues remain open and require further attention to ensure lasting stability. It is essential to address issues of territorial status, the integration of the Serbian community, strengthening trust between Serbs and Albanians, and improving economic and security cooperation. The role of international actors, such as the EU and UN, remains significant, but their effectiveness depends on the coordination and political will of all parties involved. The normalization process must be gradual, thorough, and inclusive, with an emphasis on protecting minority rights and preventing ethnic tensions. Economic aspects further complicate the situation but also offer an opportunity for stabilization through the removal of administrative barriers and strengthening trade relations, which would contribute to development and an improved quality of life for citizens. Moreover, security challenges, especially concerning migration and border management, require regional cooperation and a long-term strategy. The success of dialogue and resolving border issues depends on the coordinated engagement of all actors, both political and international, as well as local. Sustainable peace and stability can only be achieved through inclusive processes that involve cooperation, respect, and long-term commitment to regional development and reconciliation.

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SECURITY SYSTEMS IN HEALTHCARE INSTITUTIONS

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ABSTRACT

The healthcare sector is a vital component of society, tasked with ensuring the well-being of individuals. As such, healthcare institutions are often exposed to various security threats, ranging from unauthorized access to critical information to physical threats to patients and staff. The implementation of robust security systems is therefore essential to mitigate these risks and ensure the protection of both sensitive data and the physical integrity of healthcare facilities. This paper explores the various security systems employed in healthcare institutions, including physical security measures, access control systems, surveillance technologies, and cybersecurity protocols. Emphasis is placed on the integration of these systems to provide comprehensive protection. Additionally, the paper examines the role of personnel training, legal and ethical considerations, and the evolving nature of security threats in healthcare. By analyzing existing practices and highlighting emerging trends, the paper aims to offer a comprehensive overview of the challenges and solutions associated with securing healthcare institutions in the modern age.

Keywords: *Healthcare Security, Security Systems, Access Control, Physical Security*

1. INTRODUCTION

The security of healthcare institutions is a critical aspect of maintaining the safety, integrity, and trust required in medical settings. As healthcare environments increasingly rely on technology and manage sensitive data, securing both physical spaces and digital information is essential. Healthcare facilities not only provide care to vulnerable individuals but also house expensive medical equipment and confidential patient data, making them prime targets for theft, violence, or cyberattacks. To address these threats, healthcare organizations implement comprehensive security systems that include both physical and digital components. This article will explore the various elements involved in ensuring the security of medical facilities.

2. KEY COMPONENTS OF SECURITY SYSTEMS IN HEALTHCARE INSTITUTIONS

1. Physical Security Measures

Physical security refers to the strategies and systems put in place to protect a healthcare facility from unauthorized access, theft, and violence. This includes (Radovanović et al., 2014):

- Surveillance Systems: Closed-circuit television (CCTV) cameras are installed throughout healthcare facilities to monitor activity, prevent crime, and provide evidence in case of

incidents. These systems are essential in high-risk areas, such as emergency rooms, pharmacies, and areas where expensive medical equipment is stored.

- Access Control: Hospitals often use keycards, biometric scanning, or PIN-based systems to restrict access to specific areas. Sensitive areas, such as intensive care units (ICUs), operating rooms, and pharmaceutical storage rooms, require higher levels of access control to prevent unauthorized entry.
- Security Personnel: Trained security guards are essential for patrolling the facility, managing access points, and responding quickly to security incidents. They are also trained in de-escalating conflicts and handling violent situations that may arise in high-stress medical environments.

2. Cybersecurity Measures

As healthcare becomes increasingly digital, safeguarding patient data and medical records is a growing concern. Healthcare institutions are responsible for protecting vast amounts of personal and sensitive health information. Cybersecurity measures include (Radovanović et al., 2010):

- Data Encryption: Sensitive patient data, including medical histories and personal details, should be encrypted both during transmission and while stored in databases. Encryption prevents unauthorized access in the event of a breach.
- Firewall and Antivirus Protection: Healthcare organizations must invest in firewalls, antivirus software, and intrusion detection systems to protect against cyberattacks, including ransomware, phishing, and hacking attempts.
- User Authentication and Role-Based Access: Ensuring that only authorized personnel can access specific patient data is critical. Role-based access control (RBAC) helps limit data access to individuals based on their roles within the healthcare institution.
- Training and Awareness: Staff must be regularly trained on cybersecurity best practices to avoid phishing scams and other online threats. This training also includes guidelines on handling and sharing patient data securely.

3. Emergency Response Systems

Healthcare facilities are often vulnerable to a variety of emergencies, such as natural disasters, medical crises, or violent incidents. Having an emergency response system in place is crucial for ensuring safety (Randelović et al., 2009). Key components of emergency response include:

- Emergency Communication: Clear communication protocols should be in place to ensure fast and efficient coordination during an emergency. This includes the use of alarms, public address systems, and real-time messaging for staff and patients.
- Evacuation Plans: Hospitals and clinics must have detailed evacuation plans that take into account the specific needs of patients, especially those who are bedridden or in critical care. Staff should be regularly trained in evacuation procedures, including assisting patients with mobility limitations.
- Collaboration with Law Enforcement: Healthcare institutions must coordinate with local law enforcement and emergency services to respond to security threats and emergencies effectively. This includes having direct lines of communication and ensuring law enforcement is familiar with the facility's layout.

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4. Staff Training and Awareness

Human resources are a crucial part of any security system. While technology and physical security measures provide a foundation, the effectiveness of a healthcare security system relies heavily on the training and behavior of staff. Employees, from healthcare providers to security personnel, must be well-versed in:

- Recognizing Security Threats: Staff should be trained to identify signs of suspicious activity, potential threats, or unsafe behavior. This allows for early intervention and prevention (Simić, et al., 1991).
- Handling Conflict and Violence: Healthcare settings are sometimes subject to aggression or violence, particularly in emergency rooms or psychiatric wards. Staff must be trained in de-escalation techniques to handle such situations safely.
- Confidentiality and Ethical Handling of Information: Staff must also be educated on maintaining patient privacy and following established protocols for accessing and sharing medical information (Stajić, 2006).

3. THE IMPORTANCE OF SECURITY IN HEALTHCARE INSTITUTIONS

1. Protecting Patients and Healthcare Workers: Ensuring the safety of patients, medical staff, and visitors is the primary goal of any security system. Healthcare settings can be high-risk areas for violence, especially during emergencies or emotionally charged situations. Proper security measures help mitigate these risks and create a safer environment for all (Shafer et al., 1985).

2. Safeguarding Confidential Information: Medical facilities store sensitive personal information, and a breach of patient data can lead to identity theft, fraud, or harm to patients' privacy. Maintaining cybersecurity ensures that health information remains protected and complies with privacy regulations such as the Health Insurance Portability and Accountability Act (HIPAA) in the U.S.

3. Preventing Theft and Vandalism: Healthcare facilities are also vulnerable to theft of expensive medical equipment, medications, and supplies. Security systems are essential to prevent these losses and ensure that critical resources are available for patient care (Mijalković, 2009).

4. Legal Compliance and Regulatory Requirements: Healthcare institutions are subject to various regulations governing patient safety, data privacy, and security. Compliance with these regulations is crucial for avoiding legal liabilities, as well as maintaining accreditation and public trust.

Attacks on Healthcare Workers in Hospitals:

The healthcare profession is dedicated to providing care, comfort, and medical attention to individuals in need. However, in recent years, healthcare workers, particularly those in hospitals, have increasingly become the targets of verbal and physical attacks. These incidents not only affect the well-being of medical staff but also disrupt the functioning of healthcare institutions, compromise patient care, and create a toxic work environment. This article will explore the causes, consequences, and potential solutions to the problem of attacks on healthcare workers in hospitals (Mijalković, 2012).

-Understanding the Problem:

1. Types of Attacks

Attacks on healthcare workers can take various forms, ranging from verbal abuse to physical violence. Common types of attacks include (Maruschak, 2012):

- Verbal Abuse: Healthcare workers often face shouting, insults, threats, and derogatory remarks from patients, their families, or visitors. This form of abuse can be emotionally draining and can lead to burnout among medical staff.
- Physical Violence: Physical assaults may involve hitting, kicking, or even using weapons. Emergency rooms, psychiatric wards, and other high-pressure environments are particularly prone to such incidents.

- Sexual Harassment: Healthcare workers, especially women, are at risk of sexual harassment, which can range from inappropriate comments to more severe physical assault.

2. Who Are the Perpetrators?

The perpetrators of attacks on healthcare workers can be diverse. Most often, the aggression comes from patients or their families, typically due to stress, frustration, or fear (Milanović et al., 2013). Common scenarios include:

- Patients Undergoing Stressful or Painful Treatments: Patients in pain, or those who feel they are not receiving the treatment they expect, may lash out verbally or physically. The feeling of helplessness or fear of a poor diagnosis often escalates these situations.
- Family Members or Visitors: Family members, especially in emergency or critical care situations, may direct their anger or frustration toward healthcare workers if they perceive that their loved one is not receiving adequate care.
- Individuals with Mental Health Conditions: Psychiatric patients or individuals under the influence of drugs or alcohol may also be more prone to aggressive behavior, increasing the risk of violent interactions with staff (Mandić, 2004).

3. Factors Contributing to Attacks

Several factors contribute to the rising rates of violence against healthcare workers:

- Long Wait Times and Overcrowding: Hospitals, especially emergency departments, often face overcrowding and long waiting times. This creates frustration for patients and their families, leading to heightened stress and potential aggression.
- Workplace Stress: Healthcare workers face significant stress due to long hours, high patient volumes, and emotionally demanding situations. This can lead to burnout, which may increase vulnerability to attacks.
- Lack of Security Measures: Inadequate security protocols or a lack of trained personnel can leave healthcare workers exposed to violent incidents. Hospitals that fail to implement sufficient safety measures or that do not take threats seriously create an environment where violence can thrive.

4. CONSEQUENCES OF ATTACKS ON HEALTHCARE WORKERS

The consequences of these attacks are far-reaching, affecting not only the victims but also the entire healthcare system:

1. Impact on Healthcare Workers: Attacks on healthcare workers can have severe physical and psychological effects. Victims may suffer from physical injuries such as bruises, broken bones, or concussions. Psychologically, healthcare workers may experience post-traumatic stress disorder (PTSD), anxiety, depression, and a decrease in job satisfaction. This can lead to absenteeism, lower morale, and even staff turnover, which further strains the healthcare system.

2. Patient Care: When healthcare workers are under threat or fear for their safety, their ability to provide high-quality care diminishes. The stress of dealing with violence can distract staff from their responsibilities, potentially leading to mistakes, lower productivity, and reduced patient satisfaction (Nikač et al., 2012).

3. Financial Costs: Violence against healthcare workers leads to financial repercussions for hospitals. The costs associated with medical treatment for injured workers, legal fees, and potential compensation claims can be significant. In addition, the loss of experienced healthcare workers due to trauma or burnout can result in higher recruitment and training costs.

Preventing and Addressing Attacks

Addressing the issue of violence against healthcare workers requires a multifaceted approach involving prevention, intervention, and post-incident support.

1.Improved Security Measures

Hospitals must prioritize the safety of their staff by enhancing physical security. This includes:

- Installing Surveillance Cameras: CCTV systems can help monitor high-risk areas, deter potential attackers, and provide evidence if an incident occurs.
- Hiring Security Personnel: Hospitals should employ trained security staff to respond quickly to incidents, manage aggressive individuals, and provide protection for medical workers in vulnerable areas.
- Access Control: Limiting access to certain areas and ensuring that only authorized individuals can enter sensitive zones (such as emergency rooms or psychiatric wards) can reduce the risk of violence.

2.Training and Education

Healthcare workers should receive training to recognize potential signs of aggression and how to de-escalate confrontational situations. Training in conflict resolution, communication skills, and personal safety can help staff feel more equipped to manage difficult patients and avoid violent confrontations. Additionally, hospitals should educate patients and their families about expected behaviors and the consequences of aggressive actions (Nikolić, 2000).

3.Psychological Support for Healthcare Workers

Healthcare institutions must offer psychological support for staff who have experienced or witnessed violence. Counseling, stress management programs, and peer support groups can help workers process their trauma and prevent burnout. Ensuring that workers have access to mental health resources is crucial for maintaining a healthy and resilient workforce.

4.Clear Policies and Legal Action

Hospitals should have clear, zero-tolerance policies regarding violence against healthcare workers. These policies should be communicated to all staff and patients, with clear consequences for aggressive behavior. In severe cases, hospitals should not hesitate to involve law enforcement and press charges against perpetrators of violence.

5.Reducing Workplace Stress

Reducing the underlying causes of stress in healthcare settings, such as overcrowding and long work hours, is essential. Hospitals can explore options to improve working conditions, increase staffing levels, and streamline workflows to reduce stress among healthcare workers. Ensuring that healthcare workers have the support they need to manage their workload can help create a safer, more effective work environment (Pajković, 2003).

Challenges in Implementing Security Systems

Despite the clear importance of security, there are several challenges healthcare institutions face in implementing robust systems:

- Cost: Implementing advanced security systems can be expensive, particularly for smaller hospitals or clinics with limited budgets. Investments in technology, infrastructure, and training can strain financial resources.
- Balancing Security with Accessibility: Healthcare facilities must remain accessible and welcoming to patients and visitors. Striking the right balance between ensuring security and maintaining an open environment is often challenging.
- Keeping Up with Evolving Threats: As security threats evolve, healthcare institutions must continuously upgrade their systems and protocols. Staying ahead of emerging cyber threats and adapting to new security risks requires ongoing investment in technology and staff training.

5. CONCLUSION

Attacks on healthcare workers in hospitals are a serious and growing issue that demands immediate attention. By addressing the root causes of violence, improving security measures, and offering support to affected staff, healthcare institutions can create a safer environment for both workers and patients. Preventing violence is not only essential for the health and well-being of medical staff but also for maintaining the quality of care that patients receive. It is crucial that hospitals, healthcare systems, and policymakers work together to address this urgent problem and protect those who are dedicated to providing care to others. Security systems in healthcare institutions are essential to protect the safety of patients, staff, and sensitive medical data. A comprehensive approach that includes physical security measures, cybersecurity protocols, emergency response systems, and staff training is critical in mitigating risks and ensuring the smooth operation of healthcare facilities. Despite the challenges posed by costs and evolving threats, a strong security infrastructure is essential for maintaining trust and delivering high-quality healthcare. The implementation of effective security systems in healthcare institutions is a fundamental prerequisite for ensuring the safety of patients, staff, medical data, and infrastructure. As healthcare environments face growing threats—including physical violence, theft, cyberattacks, and unauthorized access to sensitive areas—integrated security systems must be strategically designed and continuously adapted. This includes the deployment of physical security measures (such as surveillance, access control, and alarm systems), as well as information security protocols that protect electronic health records and digital infrastructure. The research confirms that institutions which proactively invest in risk assessment and multilayered security systems not only reduce incident rates but also increase the overall efficiency and trust within the healthcare system. A holistic approach—encompassing personnel training, policy enforcement, and the use of modern technologies—proves essential for building resilient healthcare environments. Future advancements in AI-based monitoring and cybersecurity will further enhance the protective capabilities of these systems, emphasizing the need for ongoing investment, regulation, and education in the field of healthcare security.

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THE RISK OF CORRUPTIVE ABUSE OF INFORMATION TECHNOLOGIES IN PUBLIC ADMINISTRATION: IDENTIFICATION, CONTROL MECHANISMS AND PREVENTIVE MEASURES

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ABSTRACT

The digitalization of public administration, through the implementation of information technologies and electronic services, contributes significantly to improving efficiency, transparency, and accountability. At the same time, however, these technologies can be misused for corrupt purposes, creating new risks that must be recognized and addressed. The primary subject of this research is the analysis of risks associated with the corruptive abuse of information technologies within public administration systems. The main objective of the paper is to identify specific patterns and forms of IT misuse that may facilitate or conceal corrupt activities, and to propose effective control mechanisms and preventive measures aimed at reducing such risks. By examining selected cases of IT abuse in the context of corruption, the paper aims to contribute to the development of practical guidelines for risk management and institutional protection. Furthermore, the authors intend to encourage both anti-corruption experts and IT security professionals to engage in further research and interdisciplinary cooperation. The findings and recommendations presented are expected to serve as a foundation for enhancing the integrity of digital public administration systems and for strengthening the institutional response to corruption-related threats enabled by modern technologies.

Keywords: *corruption, information technology, public administration, risk management, IT abuse, control mechanisms, preventive measures*

1. INTRODUCTION

The use of information technologies in public administration has emerged as a cornerstone of modern governance, offering unprecedented opportunities to improve transparency, accountability, and institutional efficiency. As governments across the globe increasingly embrace digital transformation, the integration of electronic services (e-services), digital record-keeping, and automated procedures has become central to administrative reform efforts. These innovations not only streamline internal workflows and enhance service delivery to citizens, but also serve as powerful tools in the global fight against corruption by limiting discretionary power, reducing opportunities for manipulation, and ensuring greater traceability of decisions and transactions. However, while the digitalization of public administration introduces numerous safeguards against malpractice, it also opens new avenues for corruptive abuse. The misuse of information systems whether through data manipulation, transaction concealment, creation of fictitious user accounts, or deliberate disabling of audit mechanisms represents a growing threat in the digital age. Such forms of abuse may be orchestrated for personal, political, or institutional gain and can occur at all levels of public administration, including within state-owned enterprises. These risks are particularly acute in contexts where digital governance is not adequately supported by robust security protocols, oversight mechanisms, or institutional capacity.

In light of this dual potential where digital technologies can either constrain or facilitate corruption the strategic implementation and regulation of ICTs in public administration has become a critical issue for contemporary public policy. Recognizing this, the United Nations Convention against Corruption (UNCAC) has underscored the need for global cooperation in addressing technology-enabled corruption. Specifically, Article 48, Paragraph 3 of the Convention emphasizes the growing role of computer technologies in the commission of criminal offenses and calls on States Parties to strengthen information exchange and technical assistance aimed at countering such threats (UNODC, 2009). Building upon this normative framework, the present paper examines the implementation and application of digitalization in public administration as a strategic response to corruption. It explores the extent to which ICTs can support public sector integrity, drawing on international benchmarks and comparative case studies to assess both the potential and pitfalls of digital transformation. The research is grounded in secondary data provided by leading global institutions, including Transparency International and the United Nations, which offer authoritative insights into the evolving dynamics of corruption and digital governance. For the purpose of regional analysis, the study further incorporates findings from the Regional School of Public Administration (ReSPA, 2016), a collaborative initiative of the European Union and Western Balkan countries. ReSPA's comparative research provides a valuable lens into the specific challenges and successes experienced in the region, offering concrete examples from countries such as Serbia, Bosnia and Herzegovina, and Albania. These cases highlight the complex interplay between digital tools and corruption risks, illustrating how institutional gaps in IT security and oversight can create vulnerabilities despite the presence of formal digital infrastructure. Accordingly, the aim of this paper is threefold: first, to identify and classify the main risks associated with the corruptive abuse of information technologies in public administration; second, to analyze selected country cases in order to understand common methods of system manipulation; and third, to propose actionable recommendations for control mechanisms and preventive measures aligned with international standards. By synthesizing academic, institutional, and policy-level perspectives, the paper seeks to contribute both to the theoretical understanding of corruption in the digital age and to the practical efforts of public officials, IT professionals, and anti-corruption bodies working to safeguard integrity in governance. Ultimately, the research underscores that digitalization alone cannot eliminate corruption. Rather, it must be accompanied by a comprehensive risk management approach that includes continuous monitoring, capacity building, and context-sensitive technological solutions. Only through such a holistic and coordinated effort can digital tools fulfill their promise of promoting ethical, accountable, and resilient public administration systems.

2. THEORETICAL BACKGROUND

Although digitalization of business processes and cybersecurity originate from distinct disciplinary domains information technology and security studies respectively their growing interdependence and overlapping challenges highlight the need for a synergistic and integrated approach (Heeks, 2006). In the context of public administration, digital transformation extends beyond the mere implementation of IT innovations. It introduces new operational models and organizational paradigms that have the potential to fundamentally reshape the relationship between institutions and citizens, particularly in the realm of anti-corruption efforts (OECD, 2020). The application of digital tools in the public sector enables not only more efficient workflows and communication, but also contributes to the establishment of a new value system rooted in transparency, accountability, and citizen-centered governance (Šišović, 2020). These innovations create structural conditions that limit the discretionary power of public officials and reduce the likelihood of corrupt practices

Contemporary theoretical perspectives emphasize two complementary dimensions of transparency (Bertot et.al, 2010) in public administration:

- **Upward transparency**, which refers to the mechanisms through which public institutions and government officials can receive feedback from service users (citizens), enabling them to monitor internal administrative performance and adjust policies accordingly.
- **Downward transparency**, which ensures that citizens have access to relevant information about the functioning of government bodies and the results of political decision-making processes, thereby strengthening public oversight and democratic legitimacy.

Digital governance frameworks that incorporate both dimensions of transparency contribute to a more resilient public sector, capable of both resisting and proactively preventing corruption. Accordingly, the intersection of digitalization and cybersecurity represents not only a technical challenge but also a conceptual foundation for the creation of open, responsive, and accountable institutions (Kossow & Dykes, 2018). Over the past two decades, information and communication technologies (ICT) have become key tools in efforts to combat corruption and promote principles of good governance. At various levels of government, numerous initiatives have been implemented with the aim of using ICT tools to enhance institutional transparency, accountability, and efficiency. These tools have proven particularly valuable in empowering all relevant actors in the fight against corruption including state institutions, civil society organizations, grassroots movements, the media, and the private sector (Chêne, 2018). In the last ten years, a number of studies commissioned by international organizations and donor agencies as well as academic research have explored the potential of ICT tools in preventing and addressing corruption. Notable among these are reports by the U4 Anti-Corruption Resource (2014; 2016), the Asian Development Bank (Serrat, Ear-Dupuy, 2014), the United Nations Office on Drugs and Crime (UNODC, 2009), as well as academic papers by Elbahnasawy (2014) and Kossow & Kukutschka (2017). Most of these studies identify transparency as the primary mechanism underpinning the effective use of ICT tools in anti-corruption efforts (Bertot et. al., 2010). Although the terms “openness” and “transparency” are often used interchangeably in the literature, some authors point to meaningful conceptual distinctions. Birkinshaw (2006), for instance, argues that *openness* refers primarily to an institution’s willingness to engage in communication and dialogue with the public, while *transparency* refers to the clarity, accessibility, and comprehensibility of institutional processes, decisions, and data for all interested stakeholders. In this sense, openness implies proactive public engagement, whereas transparency ensures that institutional information and procedures are clearly presented and subject to oversight and evaluation. Later analyses, such as those by Serrat and Ear-Dupuy (2014) as well as by Starke et al.(2016), have emphasized the role of digitalization in the delivery of public services as an effective mechanism to reduce opportunities for corruption. By introducing transparency and automation into administrative processes, the potential for manipulation and abuse of authority is significantly diminished (Heeks, 2006). The use of information and communication technologies (ICT) enables institutional procedures to become more accessible, faster, and more subject to oversight, thereby making unlawful practices considerably more difficult to carry out.

Digital technologies are increasingly recognized as essential instruments in the fight against corruption, particularly in the domain of public service delivery. Numerous authors emphasize digitalization as a pivotal means of reducing corruption risks by streamlining administrative procedures and minimizing direct interaction between public officials and citizens (Serrat, Ear-Dupuy, 2014).

By integrating information technologies (IT) into public administration, opportunities for informal practices and corrupt behavior are significantly diminished (Kossow&Kukutschka, 2017). Automation not only enhances transparency and accountability but also facilitates more effective oversight and monitoring, thereby reducing the potential for abuse. Authors differentiate between levels of corruption ranging from petty to systemic emphasizing that responses must be tailored accordingly (Bridgman&Davis, 2014). Within this framework, digital technologies have emerged as key tools for improving transparency and accountability. However, the success of digital anti-corruption strategies depends on their adaptation to local contexts and institutional realities (Marquette & Peiffer, 2015). Digital tools, such as electronic governance systems, corruption reporting applications, blockchain technology, artificial intelligence, and big data analytics, help governments and organizations detect and reduce corrupt activities. These digital systems can provide better insight into money flows, reduce bureaucracy, and increase the availability of information to the public, making it harder to conceal irregularities (Davies& Fumega, 2014). They also facilitate the monitoring and control of contracts and public tenders, while increasing the accountability of individuals and institutions. However, there are also challenges, such as a lack of digital literacy, the risk of cyberattacks, and the resistance of corrupt structures to change. The success of digitalization strategies against corruption requires not only technical support but also political will, citizen cooperation, and the continuous modernization of technologies. Globally used digital anti-corruption tools include automation systems, whistleblowing platforms, and blockchain technologies, all of which enhance transparency and accountability (Shim& Eom, 2008). However, authors warn that transparency alone is not sufficient corruption may simply shift into more sophisticated or hidden forms (Ndou, 2004). Moreover, digital tools can pose risks: whistleblowing platforms may endanger users if not securely designed, blockchain lacks clear legal frameworks in many countries, and open data can conflict with privacy rights, especially when anonymized data is re-identified. The digital divide remains a barrier for vulnerable populations, such as the elderly or digitally illiterate, necessitating efforts to improve accessibility and digital literacy. Ultimately, the effectiveness of IT in anti-corruption efforts depends on its integration into a broader strategy that includes legal reforms, institutional strengthening, ethical standards, and civic engagement (Brajušković&Vujović, 2019). This article analyzes practical risks associated with poorly implemented digital tools and provides recommendations for mitigating them through robust technical, organizational, and procedural safeguards. These include protecting user data, ensuring system reliability, and minimizing vulnerabilities to cyberattacks or operational failures.

3. RESEARCH CONTEXT

This article examines the implementation and application of digitalization in public administration as a strategic response to reducing corruption risks. The significance of digital transformation in governance is increasingly recognized across the globe, not only by national governments but also by international frameworks. Notably, the United Nations Convention against Corruption (UNCAC) underscores the role of modern technologies in both enabling and combating corruption. Article 48, Paragraph 3, of the Convention highlights the growing use of computer technologies in the commission of crimes and calls on State Parties to strengthen cooperation in addressing corruption offenses facilitated by digital tools (UNODC, 2009). Building on this framework, the article explores how digital instruments can support public sector integrity and accountability. The analysis is grounded in a review of secondary data from established global institutions such as Transparency International and the United Nations which possess the capacity and credibility to provide comprehensive insights into corruption dynamics and the governance challenges posed by the digital era.

For the purposes of comparative case analysis, the article draws upon research conducted by the Regional School of Public Administration (ReSPA, 2016), a joint initiative of the European Union and Western Balkan countries aimed at enhancing regional cooperation in public administration reform. ReSPA has played a consistent role in promoting both integrity-based governance and digital transformation in the region. Their 2016 comparative study offers valuable insights into specific country cases, presenting both examples of the misuse of information technologies in corruption-related offenses and practical recommendations for institutional protection and risk mitigation. Additionally, the article references the *Corruption Perceptions Index -CPI* (2023), a global benchmark compiled annually by Transparency International, which ranks 180 countries based on perceived levels of public sector corruption. The CPI reveals ongoing challenges, with over two-thirds of countries scoring below 50 on a 0–100 scale (where 0 indicates high corruption and 100 very clean), and the global average score stagnating at 43 (CPI, 2023). Serbia, in particular, has seen a continued decline, maintaining a score of 36 and falling to 104th place its lowest ranking in the last 12 years under the current CPI methodology. This places Serbia behind regional peers such as Kosovo (41), North Macedonia (42), and Montenegro (46), with only Bosnia and Herzegovina (35) scoring lower (CPI, 2023). These data illustrate the persistent regional struggle with corruption, while also highlighting cases of modest improvement in countries where institutional and legislative reforms have been implemented. The integration of these sources provides a comprehensive foundation for analyzing the risks and limitations of digital anti-corruption tools within a specific regional and global context.

3.1. Case Study Framework

This section of the paper focuses on the misuse of information technologies as an enabler of corrupt practices within public administration systems in the Western Balkans. The analysis is based on case studies from Serbia, Bosnia and Herzegovina, and Albania, selected for their illustrative value in demonstrating how IT tools can be exploited to manipulate data, conceal financial transactions, and undermine institutional integrity. These examples, drawn from the comparative study conducted by the Regional School of Public Administration (ReSPA, 2016), reveal how corruption can evolve alongside digitalization, particularly when control mechanisms and cybersecurity standards are underdeveloped or circumvented from within. The case studies highlight various modalities of IT abuse, ranging from software manipulation and system bypasses to unauthorized access to citizen databases. By examining these cases, the research identifies common risk factors and institutional weaknesses, while also outlining preventive measures and lessons learned.

Case Study 1: Serbia – Toll Collection Fraud and System-Level IT Manipulation

The "Highway Mafia" case, prosecuted between 2007 and 2009, represents one of the most significant instances of IT-enabled corruption in Serbia's public infrastructure sector. A group of 53 individuals mainly employees of *Roads of Serbia* used unauthorized software and specially installed hardware to divert toll payments. The scheme involved duplicating toll receipts using irregular versions of the EMU-87 file and custom-installed cable systems, which bypassed the official toll registration system (ReSPA, 2016). Through this manipulation, approximately €6.5 million was embezzled from the national toll system. Despite the scale of the fraud, the system remained undetected for years due to the lack of effective oversight, complicity among supervisors, and inadequate auditing protocols. The case underscores how insider access and low IT security standards can create long-term vulnerabilities in digital public service systems.

Case Study 2: Bosnia and Herzegovina – Identity Fraud through CIPS System Misuse

The Citizen Identification Protection System (CIPS) in Bosnia and Herzegovina was developed to centralize the issuance of identification documents and improve data integrity. However, from the project's inception, multiple instances of system misuse were recorded, particularly in relation to issuing fraudulent ID cards and passports (ReSPA, 2016). Public officials, including police officers and municipal workers, used their credentials to access and alter data in the central registry. Individuals were able to obtain genuine identity documents under false names by exploiting gaps in the issuance process. The scale of the abuse led to multiple arrests and prompted significant institutional reforms. These included stricter verification procedures in registry offices and improved digital safeguards across administrative bodies. This case reveals how the lack of cross-institutional checks and weak authentication measures can turn centralized digital systems into powerful tools for organized crime and identity fraud.

Case Study 3: Albania – Embezzlement through Payroll System Forgery

In Albania, a high-ranking accounting clerk at the Commando Regiment base in Zall-Herr exploited her control over payroll systems to siphon funds into her personal bank account. Over an extended period, she manipulated electronic payroll records, falsified approvals, and concealed discrepancies in official communications with the military command (ReSPA, 2016). Despite internal procedures, the clerk was able to bypass controls due to weak task separation and a lack of automated verification between prepared payroll documents and actual bank transfers. The audit that revealed the scheme led to internal reforms but also exposed broader systemic vulnerabilities in the handling of sensitive financial data in public institutions. This case illustrates how insufficient internal controls and reliance on manual verification in digital systems can facilitate long-term financial fraud.

3.2. Comparative Insights

The three case studies analyzed in this paper originating from Serbia, Bosnia and Herzegovina, and Albania offer critical insights into the ways in which information technologies can be co-opted for corrupt purposes within public sector systems. While the specific mechanisms of abuse vary, from software manipulation and identity fraud to digital forgery in financial transactions, several recurring patterns and vulnerabilities emerge across all cases. First, all three examples reveal the central role of insider access and collusion. In each case, the perpetrators were public employees with legitimate access to IT systems, who either acted alone or as part of an organized group. This suggests that corruption involving digital tools is often not the result of external cyberattacks, but rather originates internally within institutions that lack strong ethical cultures and accountability frameworks. Second, these cases underscore the importance of preventive system design. In Serbia, the toll collection system was vulnerable due to its lack of real-time auditing and anomaly detection. In Bosnia and Herzegovina, the absence of cross-institutional validation enabled identity fraud. In Albania, the failure to implement separation of duties and automated payroll verification allowed long-term embezzlement. These weaknesses point to the need for embedding control mechanisms directly into the design of IT systems used in public administration. Third, the ineffectiveness of oversight and auditing mechanisms is a key enabling factor in all three contexts. Whether it was delayed inspections in toll stations, reliance on manual verification in payroll systems, or insufficient identity checks in document issuance, institutions failed to detect irregularities in a timely manner. This reflects broader issues of institutional capacity, where formal rules exist but are not operationalized through robust monitoring or enforcement practices. Fourth, these cases highlight the strategic misuse of digital records. Unlike traditional forms of corruption, digital corruption often involves sophisticated manipulation of system logs, databases, and digital signatures, which are harder to detect without specialized forensic tools.

This complicates investigations and underscores the importance of digital audit trails, secure logging practices, and tamper-evident technologies. Fifth, the cases demonstrate the need for cross-sectoral and regional learning. All three countries operate in a similar political and administrative environment, often facing shared challenges such as limited digital infrastructure maturity, under-resourced anti-corruption agencies, and politicization of oversight bodies. Sharing best practices, coordinating policy responses, and investing in regional capacity-building such as through platforms like ReSPA can help mitigate systemic vulnerabilities (ReSPA, 2016). Finally, these insights reinforce the core argument of this paper: digitalization, while offering opportunities for improved transparency and efficiency, is not inherently immune to corruption.

In fact, without accompanying reforms such as staff training, ethical enforcement, legal modernization, and technical safeguards digital tools can be repurposed to obscure rather than reveal illicit activity (UNODC, 2024). The findings support a broader understanding that anti-corruption strategies must be holistic, integrating technological innovation with institutional reform, legal enforcement, and citizen engagement. Only through such an integrated approach can information technology truly serve as an instrument for accountability, rather than a new medium for abuse.

4. MANAGING ICT CORRUPTION RISKS: LESSONS AND RECOMMENDATIONS

The case studies from Serbia, Bosnia and Herzegovina, and Albania reveal critical gaps in institutional IT security and control systems. While digital tools can enhance transparency and efficiency, they can also amplify corruption risks when not properly managed. This section offers policy-oriented recommendations to mitigate such risks, based on cross-case analysis and relevant international standards. One of the key lessons emerging from the analyzed case studies is the urgent need to strengthen access control and accountability protocols within digital public administration systems. In the Serbian “Highway Mafia” case, the absence of personalized logins and the practice of password sharing among toll booth staff allowed unauthorized actions to go undetected. To prevent such vulnerabilities, public institutions should adopt the principle of least privilege, ensuring that employees are granted access only to the data necessary for the performance of their duties (UNODC, 2024). Every user interaction with the system must be attributable, with real-time logging and audit trails in place. Equally important is the standardization and monitoring of data exchange between institutions. The case from Bosnia and Herzegovina illustrates how even technically advanced systems like the CIPS registry can be undermined by poor inter-agency coordination. Ensuring secure and synchronized communication between institutional systems requires full implementation of interoperability on multiple levels technical, semantic, organizational, and legal (Garcia & Maydom, 2023). In the Albanian case, fraud was made possible due to the disconnect between digital and physical approval workflows. Aligning these processes through automated reconciliation and built-in logic checks within public financial systems can prevent manipulation and enforce procedural integrity. Approval chains should be structured in a way that prevents unauthorized post-facto alterations. To support these efforts, countries must also adopt and consistently apply international information security standards such as ISO/IEC 27001. These standards provide a framework for access control, incident management, and data classification. Complementary to this, institutions should maintain comprehensive Business Continuity and Disaster Recovery plans, ensuring preparedness in the event of system failures or cyber incidents (Sekulovska-Jovkovska et.al, 2020).

However, technology alone is insufficient if not accompanied by a shift in organizational culture. Human factors play a critical role in information security. Practices aimed at convenience such as informal access sharing can severely compromise system integrity. Regular cybersecurity training, combined with education on ethics and professional responsibility, is necessary to foster a culture of accountability, especially among IT staff with elevated system access (Bak, 2019). Furthermore, public administrations must invest in the development of centralized, standardized base registers governed by the principle of “one data, one entry.” Such registries reduce redundancy, improve data quality, and limit the potential for internal manipulation (Cambell&Thomas, 2019). They also support interoperability across government systems, enabling faster and more reliable service delivery. While ICT is often perceived as a solution to governance challenges, it must also be understood as a potential vector for corruption. Risk assessments within public administration should explicitly address the misuse of digital tools, and anti-corruption strategies must reflect this dual nature (Kossow & Dykes, 2018). Managing these risks requires a systemic approach one that goes beyond technical measures to include institutional reform, legal clarity, and long-term capacity development. In this regard, international cooperation remains vital. The European Union, the International Monetary Fund, and other actors offer critical resources regulatory, financial, and advisory that can support national efforts. The adoption of EU directives on transparency, anti-money laundering, and public procurement helps to establish shared standards, while regional platforms such as ReSPA play an important role in facilitating peer learning and knowledge transfer. Ultimately, preventing the misuse of digital tools in public administration is not solely a technological challenge it is a question of governance. As digitalization continues to shape the public sector, the effectiveness of anti-corruption efforts will depend on the extent to which governments are able not only to adopt new technologies, but to govern them wisely and responsibly.

5. CONCLUSION

Corruption remains one of the most pressing governance challenges of our time. It undermines public trust, impedes economic development, and weakens institutional resilience. Although most countries have established integrity systems comprised of laws, institutions, and procedures to counter corruption, their effectiveness often varies depending on the degree of interconnectivity, coordination, and political will. A truly effective anti-corruption strategy cannot rely on isolated reforms, but must instead address the entire integrity ecosystem linking the judiciary, executive and legislative powers, independent oversight bodies, the media, and civil society in a coherent and mutually reinforcing manner. Digitalization offers significant potential in this context. It introduces new mechanisms for enhancing transparency, reducing discretionary power, and improving the traceability of administrative actions. However, as this paper demonstrates, digital tools can also be repurposed for corrupt practices if not accompanied by adequate safeguards. The case studies from Serbia, Bosnia and Herzegovina, and Albania clearly illustrate how information technologies can be manipulated for personal or organizational gain often from within the very institutions tasked with serving the public good. The empirical analysis confirms that digital systems are not inherently immune to misuse; in fact, they may introduce new types of vulnerabilities. Inadequate access control, a lack of interoperability, weak audit mechanisms, and poor coordination among institutions often create the conditions under which corruption can persist, even in digital environments. At the same time, these risks can be mitigated through the implementation of international IT security standards, harmonized administrative procedures, comprehensive training, and greater citizen engagement. Importantly, this paper argues that ICT must be understood not only as a technical solution, but as part of a broader governance framework.

Its impact on anti-corruption efforts depends heavily on the institutional, legal, and cultural context in which it is implemented. Technology alone cannot replace the need for an independent judiciary, a robust regulatory framework, and a political climate that promotes openness and accountability. Efforts to combat corruption must therefore be systemic and multidimensional. Digitalization represents a powerful opportunity one that should not be overlooked but its potential can only be realized through coordinated reforms, institutional learning, and partnerships among public authorities, international actors, and civil society. Regional cooperation platforms such as ReSPA offer valuable support for peer learning and the development of context-sensitive solutions tailored to the specific needs of Western Balkan administrations. Ultimately, the authors of this paper emphasize that the fight against corruption is not a finite task, but a continuous process that must evolve alongside social and technological developments. By promoting knowledge exchange, adopting adaptable ICT strategies, and strengthening institutional capacities, governments can move toward a culture of integrity and accountability one that not only resists corruption but actively fosters public trust and democratic legitimacy. It is our hope that the insights presented in this study will inspire further research and policy innovation in the field of digital governance and anti-corruption, contributing to the development of more resilient, transparent, and ethical public administrations.

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INTEGRATION OF QUALITY INTO THE PUBLIC SERVICES MANAGEMENT SYSTEM

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ABSTRACT

This paper addresses the enhancement of public administration quality in the Republic of Serbia, with a particular focus on the implementation of quality management systems within the framework of e-government. The introduction outlines the issue of citizen dissatisfaction with public administration services and emphasizes the importance of achieving more efficient and transparent operations within public institutions. The paper highlights the necessity of adopting modern quality management principles in the public sector, aiming to improve user satisfaction and service efficiency. Within the theoretical framework, key aspects of quality management and its application in public administration are examined, while the empirical section analyzes the state of e-government implementation across local self-government units in Serbia. The research is based on data from the report of Development Consulting Group (DCG d.o.o.) concerning the implementation of e-government in 60 local self-government units, supported by the Swiss PRO program. The primary objective of the research is to determine the correlation between the quality of e-services and user satisfaction, as well as the existence of quality assurance mechanisms in public service delivery. The research findings may contribute to the advancement of public administration through the application of modern management principles and technologies, ultimately enhancing the quality of services provided in the public sector.

Keywords: *e-government, public administration, quality management, service management, user satisfaction*

1. INTRODUCTION

For many years, the state administration has had a reputation for inefficient service provision, which often causes dissatisfaction among citizens and the public. In order to improve this situation, state authorities have taken significant steps in recent years to improve the quality of services in the public sector. Public administration bodies have the task of delivering services, and in some cases goods or capital, in a transparent, democratic, effective and efficient manner, in order to satisfy the users of public services (Stamatović et al., 2016). Consideration of this topic can be viewed from the perspective of populist policies and direct satisfaction of citizens, given that citizens are faced with challenges in this area every day. Public administration is traditionally characterized by bureaucratic procedures, a rigid and centralized organizational structure, a wide scope of activities, adherence to routines and repetitive processes. As a result, public administration activities often have a limited scope in solving problems, and more often serve to mitigate them. The implementation of the quality management system in public administration is a key factor in improving the functioning of this sector and facilitating the realization of citizens' rights. Quality public administration means achieving optimal results with maximum efficiency (Davinić, 2010). The concept of quality, which is already well developed in the private sector, is becoming increasingly important for the public sector as well, where it is necessary to introduce the principles of quality management as an integral part of management processes (Filipović & Ćirić, 2010). The method of implementing the quality system varies depending on the specifics of each organization, and is particularly complex in the context of public administration due to different institutional and organizational characteristics.

This paper focuses on how quality improvement can contribute to greater satisfaction of citizens and users of public services, but at the same time points to the fact that it does not necessarily increase trust in public administration and public institutions. In order to increase citizens' trust in the public sector, a broader concept of quality is necessary that includes the interaction between public, voluntary and private organizations that participate in providing services and solving social problems. The authors of this paper aim to highlight key aspects of the modern quality management system and its impact on changes in organizations through theoretical considerations, with a special emphasis on application in public administration. Also, the work offers insight into basic concepts and definitions that can help in better understanding the quality of service provision in the public sector and the importance of efficient public administration. The empirical segment of the research encompasses an analysis of available data on the state of electronic administration in local self-government units (LSGUs) in the Republic of Serbia, using the report of the consulting company *Development Consulting Group* (DCG d.o.o.) as a source, prepared within the *Swiss PRO* program, implemented with the financial support of the Government of Switzerland. In this context, one of the key normative and institutional achievements in the area of public administration reform is the adoption of the Law on Electronic Administration, which entered into force on April 14, 2018 ("Official Gazette of RS", 2018), as well as the establishment of the Office for Information Technologies and Electronic Administration, as the central institution responsible for the development and coordination of digitalization in the public sector. The aim of this paper is to analyze the potential for improving the performance of public administration in the Republic of Serbia through the application of quality management principles, with particular emphasis on measuring the level of quality in public service delivery. The research framework is based on the assumption that there is a significant correlation between the quality of public sector management and citizens' satisfaction with electronic services, as well as the capacity of local self-government units to implement such services effectively. The research is grounded in the following hypotheses:

- **H1:** The application of quality management principles and concepts in public administration is statistically significantly related to the level of user satisfaction with e-Government services.
- **H2:** The existence and implementation of quality assurance mechanisms in public service delivery have a significant impact on the efficiency of those services.

In this paper, the authors aim to contribute to the enhancement of public administration performance in the Republic of Serbia through the application of a modern concept of quality management in the provision of public sector services as a whole. The assessment of public management quality is a complex process that requires a detailed analysis of the existing conditions as a starting point for further development. Particular emphasis is placed on the importance of integrating quality across various management domains, as well as on the necessity of a systemic approach in the implementation of new knowledge, skills, and technologies within administrative processes.

2. APPROACH TO DEFINING THE QUALITY OF SERVICES IN THE PUBLIC SECTOR

Understanding the quality of services in public administration is crucial for the analysis of the success of reforms and the development of modern public management models, especially in the context of digitization and increasing user expectations. Public services form the basis of the functioning of modern societies, because they include services that are essential for the daily life of citizens. However, evaluating the quality of these services is challenging, as it is difficult

to directly relate results to the efforts of service providers or to accurately determine quality. The definition of quality depends on the perspective of the observer - while service providers often have clearly defined criteria, users have different expectations and requirements (Viktorović, 2011). The quality of services in public administration depends on the continuous development of user experiences and expectations, which are set as new standards over time. Achieving a high quality of services is only possible if the expectations of the users are met, which shifts the quality assessment from the service provider to the users. To achieve high quality, a deep understanding of users' needs, social environments, lifestyles and other factors is crucial. Although the quality system is a newer approach, quality has always played an important role in public administration, even when it was not systematically considered (Maksimović et al., 2020). According to Beltrami (Halachmi & Bouckert, 1995), the development of quality in the public sector can be observed through three phases: 1) compliance with norms and procedures, 2) effectiveness and 3) user satisfaction. In order to achieve high quality, a key role is played by management, which should possess appropriate skills and knowledge in order to create an atmosphere that enables quality improvement. Management applies two basic groups of activities to improve quality (Vojnović, 2008):

1. **Hard measures** - Activities aimed at defining and documenting quality through procedures, specifications, instructions and other forms, with sanctions in case of non-compliance with the rules.

2. **Soft measures** - Focused on the motivation, organization and training of employees, which contributes to the creation of a culture of quality within the organization.

The implementation of the quality management system in public administration shows that business-oriented quality models find the most fertile ground in public enterprises operating in market conditions. In contrast, ministries and other administrative units often face serious challenges in establishing and maintaining these systems. Quality management in public administration implies a systemic approach aimed at continuous improvement of value for users through the optimization of organizational processes and structures (Filipović & Ćirić, 2010). In order to improve the level of quality of their services, public administrations should be guided by the basic principles of modern management, among which Viktorović (2011) singles out:

- Separation of strategic public policy from operational management,
- Focusing on results and not on processes and procedures,
- Orientation towards the needs of citizens, not the interests of bureaucrats,
- Involvement of citizens through participatory decision-making models,
- Change management culture and approach.

In the modern model of public management, the emphasis is increasingly placed on achieving tangible results for end users, whereby traditional administrative models are gradually transformed. This approach requires specific professional knowledge, developed skills and a deep understanding of legal-administrative procedures. The implementation of the quality management system enables public administrations to organize their activities more efficiently, rationalize operational processes, increase service quality standards and continue with the implementation of comprehensive structural reforms. In this context, the development of mechanisms for the systematic collection and analysis of feedback from users becomes an indispensable element of continuous improvement. Feedback not only enables a better understanding of citizens' needs, but also contributes to a greater degree of transparency and accountability of public administration. Finally, through the implementation of these principles

and practices, public administrations can become more agile, flexible and ready to respond to the complex challenges of a dynamically changing social and economic environment.

2.1. Quality management system as an instrument of modernization of public administration

In order to implement the concept of new public management with quality, it is necessary for public administrations to modernize their operations, adopting changes in the way of working through the implementation of the Total Quality Management (TQM) system. The process of total quality management in public administration consists of four key phases (Janićijević, 2004):

1. **Process selection** – The first phase includes the identification of processes that require improvement. Here, it is important to define processes, their users, quality measurement criteria and select those processes that provide the greatest opportunity for improvement.
2. **Process evaluation** – In this phase, the current state of the process is analyzed and performance is evaluated. Criteria such as quality, process cycle time and productivity are used to measure the effectiveness of services.
3. **Standardization of processes** – Processes are transformed into standard procedures that enable uniformity and consistency in the performance of services. Employee training and proactive process monitoring ensure that procedures are followed correctly.
4. **Process Improvement** – In the last phase, processes are continually improved based on performance measurement and problem solving. Each change is standardized to minimize errors and ensure continuous progress.

The key value of TQM in public administration is that the approach considers the entire organization as a series of interrelated processes, where quality is prioritized in order to satisfy customer needs. The quality culture that develops through the implementation of TQM puts the customer at the center, which is a fundamental change compared to previous administrative approaches. This process has been proven effective for improving the organizational structure and processes in public administrations. Through systematic quality management and the application of modern principles of public management, public administration can respond to the growing demands of citizens, increase efficiency and contribute to greater trust in institutions.

3. THE ROLE AND IMPORTANCE OF KNOWLEDGE IN PUBLIC ADMINISTRATION

Learning and knowledge are becoming an increasingly important aspect of work culture in public administration. The principles of the new economy are based on acquiring knowledge and learning how to effectively manage that knowledge. Globalization, together with increasing competition in the provision of services, offers challenges that encourage public administration to reject established stereotypes and traditional approaches (such as outdated document management systems). Instead, it must be directed towards the creation of a positive environment and a creative work environment that encourages employees to exchange ideas, knowledge and innovations, and to develop a culture that is based on learning and adopting new technologies, such as modern document management systems. Public administration must constantly adapt to the needs of its users. In order to achieve this, it must be based on creativity, highly qualified staff and the willingness of employees to constantly acquire new knowledge and skills. In this context, providing services becomes a problem-solving process, which is why it is crucial that employees are capable, highly educated and have a wealth of experience.

The public administration should develop a clear strategy and implement a system of values that enable not only the retention of existing personnel, but also the attraction of new experts who are in high demand on the labor market. This process is not only driven by high salaries and benefits packages, but also by creating a stimulating work environment in which individuals and the organization as a whole will continuously increase their creativity, innovation and knowledge. The use of new technologies, expert systems, knowledge management systems, as well as Internet technologies, directly contributes to the improvement of services, more efficient management and faster exchange of knowledge. However, passive and unused knowledge does not contribute to the creation of new value or the development of intellectual capital. That is why it is of crucial importance to create conditions and culture that motivate employees for constant learning, teamwork, exchange of experiences and knowledge, as well as the development of creativity and innovation. Introducing a culture of learning and continuous acquisition of knowledge is a key factor for improving the work of public administration. By creating an environment that encourages creativity, innovation and efficient exchange of knowledge, public administration can significantly improve the quality of services, improve its internal processes and respond more effectively to the needs of its users. Also, developing strategies that integrate new technologies and knowledge management systems can contribute to the sustainable development and competitiveness of public organizations.

4. CONCEPTUAL FRAMEWORK FOR THE NEW DOCUMENT MANAGEMENT SYSTEM

The concept of new public management represents a significant transformation of management paradigms in public administration, with a special emphasis on improving the efficiency and quality of services, in order to fully satisfy the needs of users. The implementation of this concept enables organizations in public administration to improve internal processes, rationalize operational activities, improve the quality of services they provide to end users, and continue with the implementation of structural reforms (Mateljak & Gjurković, 2016). Although the new approach relies on previous management models, it emphasizes the need to achieve higher levels of efficiency, effectiveness and economy, based on the "three E" principle - efficiency, effectiveness and economy (Vučinić, 2020). The evolution of public administration during the middle of the 20th century brings the introduction of market mechanisms into administrative systems, which achieves greater efficiency and effectiveness in the management process. In addition to the exchange of data and information, this trend also includes the application of specific knowledge that enables business improvement, especially within modern systems for document management in public administration. These systems provide key information to employees and users, before, during and after the provision of services, thus contributing to a more efficient execution of administrative procedures. The basic prerequisite for the implementation of this system is the development of appropriate infrastructure support, especially through the application of advanced information and communication technologies. The first step in the process of modernization of public administration involves the implementation of new methods, tools and applications within the framework of the document management system. Such a system should integrate the elements of strategy, service processes, service analysis and information technologies, thus enabling efficient collection, analysis, distribution and application of business information. This approach contributes to solving management problems and making optimal business decisions (Tepšić & Radivojević, 2010). Technically, the new system is a public administration information system, but with key differences in approach: data sources are diverse and come from both the public administration and the external environment, including service users. The presentation of that data must be precise and clear in order to enable quality insight.

The new system is characterized by the integration of intelligent mechanisms for planning and analyzing events in public administration, which are presented through numerical language (binary notation). This approach enables unique access to all information in public administration, so that users can receive accurate information and appropriate services at any time (Radivojević, 2007). A document management system can be defined as a set of applications that enable the organization and structuring of data on business transactions, which is useful for supporting service, decision-making and operational activities. By using new technologies, public administration can more effectively connect its employees, service users, suppliers and other relevant partners. These tools enable insight into complex data, reducing the amount of information employees are exposed to, while simultaneously improving the quality of that data. The main goal of this new approach is to generate accurate information and knowledge that are key to providing better services and making adequate business decisions. In order to provide the right services to the right users, at the right time, it is necessary to use both internal and external data sets. The new document management system should integrate these two types of data, thus enabling more efficient service. Internal data in public administration is collected according to established rules and placed in appropriate databases, while external information must also be included for complete insight (Tepšić & Radivojević, 2010). The key objectives of the system include analysis of user behavior, identification of key users of services, mapping of cost sources, more efficient servicing, better communication, analysis of service efficiency, enabling self-service, providing specific services to selected users, and forecasting future trends. The new system also enables monitoring of achievements in real time, which significantly accelerates the process of making operational and strategic decisions. This approach can reduce decision-making time from weeks to days, hours, or even minutes (or seconds). It is expected that the new document management system will have a wide impact on almost all areas of work in public administration, including increasing user and employee satisfaction, reducing costs, providing more efficient service and improving self-service. One of the key features of this system is its ability to adapt to changes in external and internal conditions of public administration, which was not the case with previous systems. The new system belongs to the category of "learning systems", which means that by collecting new data from external sources and combining them with internal and transactional data, new value is created through the generation of quality information and knowledge (Vidović, 2003). The efficiency of the system is improved through iterative processing processes, whereby the acquired knowledge is applied in future operations. The implementation of the new document management system in public and state administration contributes to the simplification of administrative procedures, especially in areas such as the tax system, health insurance and social protection, thereby reducing costs and raising the quality of services to citizens.

4.1. Improving the efficiency of public administration through the application of standards

For the modern functioning of local self-government units, it is crucial to introduce standardized work processes and service quality control procedures, as well as the work processes themselves within local self-government. The goal of achieving certification according to ISO standards (International Organization for Standardization) is to improve the efficiency of municipal administrations and provide faster and better services to citizens as users of public services. The ISO 9000 standards, which include guidelines for harmonizing the existing quality management system (QMS) or total quality management (TQM) with international norms, enable the implementation of a system based on recognized international quality standards (Radulovački & Šilobad, 2001). ISO standards represent codified work methodologies that define the procedure and sequence of activities within the municipal administration, as well as the method of preparing appropriate documentation and acts.

Basically, these standards enable the implementation of unique procedures applied in municipal administration, which are described in detail and standardized in accordance with the needs of the work processes themselves (Kalač, 2011). Through the implementation of ISO standards, the municipal administration can achieve a higher level of efficiency, accuracy, courtesy, responsibility and trust, which results in a higher degree of satisfaction of the citizens, who are the end users of the services. Quality preparation for certification is one of the key factors in the process of implementing ISO standards. In addition to the commitment of the municipal leadership, the preparation includes the identification of key processes, training of employees and analysis of the current situation in the organization. Further steps in the certification process include the preparation of documentation, a pre-certification audit and the certification itself, as well as a post-certification period that entails constant monitoring and improvement of the system, and in order to ensure the quality of the services it provides, it is imperative for the local administration to recognize the process that contributes to quality and establish a documented system, according to the SRPS ISO 9001:2008 and IWA 4:2005 (International Workshop Agreement) standards (Radulovački & Šilobad, 2001). In the context of municipal administration, ISO 9000 standards imply the implementation of a quality management system that includes organizational structure, procedures, processes and resources, which are set with the aim of preventing non-conformities and continuous improvement. The processes within this system include the identification of user requirements and expectations, as well as all phases of service implementation. Also, the system is based on internal quality checks and analysis of the effects of implemented activities, with the identification of opportunities for further improvements. The documentation of the quality management system, which includes rules of procedure, procedures, instructions and records, is the basis for the implementation of all activities in the municipal administration, while it is adapted to the specifics of the processes that take place within the organization itself (SRPS ISO 9000:2007, 2007). Application of the ISO 9000 standard in municipal administration contributes to the improvement of management functions, more efficient use of resources and better results of services provided to citizens. Specific goals that are achieved through the implementation of ISO standards include a clear definition of policy and management goals, a better understanding of user requirements, improvement of internal and external communication, as well as cost reduction and increased productivity. Also, ISO standards enable the precise definition of responsibilities and powers within the municipal administration, which ensures a greater focus on the efficient performance of tasks and satisfaction of the demands of citizens and legal entities (SRPS ISO 9000:2007, 2007). The main goal of implementing ISO 9000 standards in local self-government is to meet the requirements of all interested parties, including citizens, employees, suppliers, society and the economy. Certification according to ISO standards indicates that the municipal administration successfully manages the quality of its services and is responsive to the needs of citizens and employees. This process not only improves the quality of services, but also contributes to social development, setting a good example for other local governments in terms of efficient management and concern for the public interest (Radulovački & Šilobad, 2001). The implementation of the ISO 9000 standard in local self-government enables significant improvements in the work of municipal administrations, making them more efficient, transparent and oriented towards the continuous development and satisfaction of citizens.

4.2. Expected benefit of the new system

In modern public administration, lack of data is rarely a key problem. The bigger challenge is the identification and access to those data that can contribute to more efficient work and making better decisions, with the aim of reducing costs and improving the quality of services.

The application of new tools enables a significant reduction in the time needed to create reports, thus freeing up more time for data analysis and decision-making based on relevant information. This concept also enables monitoring the performance of administrations, administrative organizations and local self-government units in real time, whereby information and knowledge are available exactly when they are most needed. In this way, the process of making operational and strategic decisions is shortened - from a time frame of a week to a day, an hour, and even to a minute or a second. It is expected that the new document management system (DMS) will be integrated into almost all areas of public administration work. It is expected to have a positive impact on increasing user and employee satisfaction, reducing business costs, increasing the efficiency of services, as well as enabling self-service options and advanced services. Although the current concepts are mainly reduced to reporting on the state and realization of business processes, in the future the power of information and knowledge, generated with the help of new tools, will enable a significant improvement of the service process. User requests for new document management system tools include the following:

- **Secure environment:** Information and knowledge contained in the new system must be adequately protected against unauthorized access and use.
- **Availability and accessibility through various communication channels:** Applications are expected to be available at any time and at any place, thus ensuring their continuous operability.
- **High degree of adaptability:** Systems must have the ability to quickly process data and react to dynamic changes in the business environment and business conditions.
- **Memory scalability and satisfactory efficiency:** Given the constant growth of the amount of data and the number of users, new systems must provide an appropriate level of efficiency and enable a scalable and extensible working environment.

The implementation of such a system represents a key step towards the modernization of public administration and the provision of more efficient, safer and more accessible services for citizens and all users of public services. In this way, new document management systems become the basis for the development of proactive, transparent and user-oriented public administration. Their implementation contributes not only to increasing operational efficiency, but also to strengthening citizens' trust in the work of public institutions. New document management systems represent a key support for the modernization of public administration, enabling faster decision-making, greater efficiency of services and better satisfaction of citizens' needs. Their application leads to safer, more accessible and more adaptable management, which creates the basis for sustainable development and strengthening of trust in public institutions.

5. IMPLEMENTATION PROCEDURE OF THE NEW DOCUMENT MANAGEMENT SYSTEM

The adoption of a new document management system in public administration requires the development of a comprehensive introduction strategy, bearing in mind that such systems, unlike traditional transactional solutions, are not static but subject to constant development in accordance with changes in the business environment. The goal is to establish a system that enables optimal service with continuous upgrading. Literature and practice suggest different implementation strategies: from introducing changes where the results are most visible, to intervention in areas with the greatest resistance. Key issues relate to the identification of changes, the method of system development, successful implementation and efficient distribution of information.

The basic task of the project is to clearly define goals and solve specific problems in the analysis of services, user satisfaction and cash flows. The project requires significant investment and carries the risk of recovery of funds, because the system includes hardware, software, people, data and organizational processes. Therefore, it is necessary to involve all interested parties, have a good understanding of business processes and devote sufficient time to planning and implementation. Without a clearly defined objective, it is not recommended to issue a tender focused solely on technology, ignoring business issues.

Basic stages of project construction:

- **Planning:** Carefully define goals and work methods. Analysis of business processes through interviews with users and review of standard reports provides an initial snapshot of the situation.
- **Defining business requirements:** Modeling the process as the basis of the system, with the creation of a specification of terms in an understandable language, through chapters such as the purpose of the model, matrices and dimensions.
- **Feasibility assessment:** Before implementation, conduct a feasibility assessment. It is recommended to start with simpler segments, with the organization of user training and a focus on practical use of the system.

Implementation should be iterative, adapting to new conditions and requirements. The new system should function as a "learning system", accumulating new knowledge through combining internal and external data, thereby increasing its efficiency and effectiveness. The value of information grows proportionally to the square of the number of users and the area of their application. Public administrations that apply modern DMS concepts achieve better control over information, which leads to simplification of administrative procedures, reduction of costs and increase in the quality of life of citizens. Special attention should be paid to the ease of use of the system in order to make it accessible to users with basic IT knowledge, which enables wider application and faster acceptance. The implementation of the new document management system represents a strategic step towards the modernization of public administration and raising the quality of services for citizens. Its success depends on careful planning, an inclusive approach and a constant willingness to adapt to change. Ultimately, a well-designed and properly implemented system will become the foundation for a more efficient, transparent and user-oriented public administration.

6. APPLICATION OF E-GOVERNMENT AS A TOOL FOR IMPROVING QUALITY MANAGEMENT

E-governance means providing public administration services to citizens and the economy electronically, with the aim of encouraging democratic participation and removing obstacles to business. The OECD defines e-government as the use of information and communication technologies, especially the Internet, to achieve better government results (OECD, 2020). In Serbia, administration is traditionally based on paper documentation, despite the gradual introduction of e-business. The practice still involves printing e-documents and managing cases in physical form, which is a consequence of the outdated legal framework, which has not been reformed for more than two decades. Although regulations have been adopted to support digitization, the paradigm of "official paper" persists, and even fully electronically conducted procedures end up with the printing of documents due to court requirements. This practice slows down the work of the administration, increases administrative costs and makes data availability difficult. Huge amounts of paper documents require significant resources for storage, while the loss of documents negatively affects the rights of citizens and the efficiency of the economy.

Increased use of information systems would enable more efficient public administration, reduce the need for physical documentation and improve transparency. The prerequisites for this are the establishment of legal bases for the long-term storage of electronic documents and the reform of the concept of categorization of documentary material. The goal of the transformation of public administration in Serbia is to achieve a high degree of digitization, which would facilitate the search, analysis and availability of documentation, improve the connection of databases and reduce the costs of physical archiving. The public administration reform strategy, implemented under the slogan "Administration tailored to all of us", envisages a more efficient and depoliticized public administration focused on citizens ("Official Gazette of RS", no. 42/21, 2021). The development of e-government is implemented through the Electronic Government Development Program for the period 2020-2022, as well as through regulatory reforms such as the "e-Papir" program. The process of transition from paper to electronic administration is long and complex, and success depends on public demand for certain services and reduction of internal costs. The UNPAN model (Web Measure Assessment) describes five stages of online presence: initial presence, enhanced presence, interaction, transaction and transformation (Simović, 2013). In the final phase, all information systems are integrated, and the public accesses services through a "single virtual counter", which enables maximum efficiency and user satisfaction. The ideal of a single electronic counter ("single window") symbolizes the ultimate goal of the reform - the availability of all public services to citizens through a simple online method, which cannot be achieved without comprehensive application of information and communication technologies.

6.1. Analysis of citizen satisfaction as a result of the application of modern quality standards in public administration

A project implemented by the Development Consulting Group (DCG d.o.o.) in 60 selected LGUs, financed through the Swiss PRO program, with the support of the Government of Switzerland, which aims to improve good governance and social inclusion, served as the basis for research on the impact of the implementation of the principles of quality management in public administration, with an emphasis on users of eGovernment in Serbia. For the purpose of accurate data collection, a tool was developed that not only evaluates the web presentations and eServices of LGUs, but also focuses on institutional, technical and personnel capacities, as well as on the perception of citizens and entrepreneurs, their IT literacy and readiness to use eGovernment. This tool generates reports by municipality, as well as comprehensive statistical reports that enable comparative analyzes (SWISS PRO, 2019). According to Swiss PRO EGDI 2018, the research relies on three main indicators: 1) provision of electronic services, 2) capacity and readiness of LGUs for the implementation of eServices, and 3) information literacy, perception and user satisfaction with eGovernment services (SWISS PRO, 2019). The highest ranking was achieved by the municipalities of Zrenjanin, Novi Pazar and Pancevo, which have updated websites, trained IT administrators and improved technical capacities in accordance with interoperability standards. On the other hand, municipalities such as Kruševac, Vranje and Užice are ranked lower (SWISS PRO, 2019). Although the municipalities of Knjaževac and Vrnjačka Banja achieved the best results, with functional eServices on the eGovernment portal and the implementation of eZUP for internal data exchange, other municipalities face challenges, including low readiness and technical deficiencies (SWISS PRO, 2019). In line with the defined research objective, which focuses on improving the performance of public administration in the Republic of Serbia through the application of quality management principles, particular attention is given to measuring the quality of public service delivery. In this context, and with the aim of examining user satisfaction with electronic services, the research is guided by the following hypotheses:

H1: The application of quality management principles and concepts in public administration is statistically significantly associated with the level of user satisfaction with eGovernment services, and **H2:** The existence and implementation of quality assurance mechanisms in the delivery of public services have a significant impact on the efficiency of service provision.

The conducted research indicates that only 24 municipalities (40%) in Serbia provide electronic services via the official eGovernment portal, while the majority offer only basic administrative services, such as issuing citizenship and registry certificates. Although electronic registries are operational in 90% of local governments and geographic information systems (GIS) are available in two-thirds of them, interactive access to such data is enabled in only 13 municipalities (SWISS PRO, 2019). Despite the fact that the eGovernment portal is widely known among citizens and business entities, a relatively small number of users have successfully completed online forms and received documents at their home addresses. This indicates a limited level of functional usability of the system. The most frequently requested services relate to the issuance of personal documents, while the business community primarily expresses interest in services such as company registration and electronic submission of financial statements (SWISS PRO, 2019). Identified challenges include system errors, poor connectivity, limited scope of available services, and a complex registration process. However, user feedback highlights that raising awareness of the benefits of eGovernment is equally important as addressing technical shortcomings. Furthermore, a lack of mechanisms for monitoring eGovernment development and the duplication of services due to inconsistent database entries represent structural problems within the system. The new version of the eGovernment portal, currently under development, is expected to address these deficiencies through the standardization of service provision (SWISS PRO, 2019). A key recommendation of the SWISS PRO report is that the management of eServices remains insufficiently integrated into the everyday operations of local government organizational units, while data management practices are generally inadequate. Since the effectiveness of eServices largely depends on the accuracy and reliability of data, the findings show that local governments that apply quality management principles report significantly higher levels of user satisfaction (SWISS PRO, 2019). Based on the analysis results, a set of standards was proposed for improving the quality and functionality of eServices, thereby confirming the second research hypothesis regarding the importance of quality assurance mechanisms. The following key standards were identified (Vukotić et al., 2018):

1. Development of capacities for digital transformation
2. Establishment or enhancement of the application environment
3. Establishment or improvement of the hardware infrastructure
4. Enhancement of the communication infrastructure (internet, intranet, and extranet networks)
5. Ensuring information security
6. Optimization of internal processes and organizational efficiency.

The implementation of these standards is expected to positively influence the efficiency of service delivery, increase user satisfaction, and reduce operational costs in public administration. Moreover, better integration of eServices into routine administrative processes will contribute to the development of a sustainable quality management system in the public sector. Continuous monitoring and evaluation of standard implementation will further support the identification of improvement areas and ensure the long-term effectiveness of the eGovernment system.

7. CONCLUSION

The aim of this paper was to highlight the importance of applying quality management principles in the public administration of the Republic of Serbia, with a particular focus on digitalization and the improvement of electronic services (eGovernment). Through theoretical and empirical analysis, the research demonstrated that the advancement of the public sector requires a systemic approach encompassing the organizational structure, processes, resources, and instruments for quality management. Empirical data indicate a low level of development of eServices at the local level—only 40% of municipalities provide services via the national eGovernment portal, while interactive functionalities are available in just 13 local self-government units. Although electronic registries and GIS systems are technically present, their practical application is limited. In addition to technical challenges (system errors, poor connectivity, complex registration procedures), the need to raise awareness among citizens and public employees about the benefits of using eGovernment was emphasized. The research findings confirmed the initial assumptions by demonstrating that there is a positive correlation between the application of quality management principles and concepts in public administration and the level of user satisfaction with eGovernment services. Moreover, the analysis showed that the efficiency of public service delivery is closely linked to the existence and effective implementation of mechanisms aimed at ensuring service quality. The implementation of a quality management system enables public administration to establish clearly defined standards and criteria for measuring performance, and to continuously monitor and improve the transparency and effectiveness of its services. The key standards identified through the research—development of digital capacities, improvement of application and hardware environments, enhancement of communication infrastructure, information security, and optimization of internal processes—serve as the foundation for establishing a sustainable quality management system in the public sector. Particular emphasis is placed on the introduction of modern document management systems, which reduce administrative burden, accelerate service delivery, and enhance the accuracy and reliability of operations. Furthermore, improved public access to documents and acts contributes to greater transparency and institutional accountability. Considering the ongoing digitalization process in Serbia, it is essential to further strengthen the institutional, technical, and human capacities necessary for the implementation and continuous improvement of eServices. Evidence-based recommendations indicate the need to enhance organizational capacities, improve user communication, and implement structural changes in the organization and operations of public institutions. In conclusion, this paper contributes to a better understanding of the quality management concept in public administration and the development of eGovernment in Serbia, offering practical guidance for the further advancement of a system based on efficiency, user satisfaction, and the principles of good governance. Continuous monitoring and evaluation of the implemented measures and standards remain key to ensuring the long-term sustainability and resilience of public administration in a modern digital environment.

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THE LAW ON BIOMEDICALLY ASSISTED REPRODUCTION AND THE DISCRIMINATION OF SINGLE WOMEN FROM THE PERSPECTIVE OF THE RIGHT TO CHILDBEARING

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ABSTRACT

Reproductive rights are universally recognized as human rights for both women and men. However, when addressing the right to procreate, we are specifically referring to a subset of reproductive rights that should be considered the exclusive domain of women, given that only women are biologically predisposed to give birth. In this context, the Family Law of the Republic of Serbia explicitly designates women as the primary holders of the right to procreate. In contrast, the Constitution of the Republic of Serbia guarantees the right to procreation to both women and men. The legal complexity surrounding the right to procreation becomes more pronounced when examining the provisions of the Law on Medically Assisted Reproduction, particularly with respect to eligibility for such procedures. Under this law, the right to medically assisted reproduction is extended to both women and men who are in a marital or common-law partnership, whereas single women are granted access to these procedures only under exceptional circumstances. Given that only women have the biological capacity to give birth, and that the law prioritizes couples in the provision of medically assisted reproduction services, it can be argued that the relevant legal provisions constitute discriminatory treatment of single women. This assertion arises from an analysis of the statutory framework, as well as from the constitutional principles concerning both the right to procreate and the prohibition of discrimination.

Keywords: *discrimination, reproductive rights, medically assisted reproduction, single women, right to childbearing*

1. INTRODUCTION

Reproductive rights represent a fundamental component of human rights, closely linked to the principles of human dignity, bodily autonomy, and gender equality. In contemporary legal discourse, these rights are most commonly understood as encompassing the freedom of individuals to decide whether to have children, when to have them, and under what conditions—free from coercion, discrimination, or violence. Despite this broad international consensus, the legal regulation of reproductive rights often reflects deeper societal values, historical legacies, and normative assumptions about gender roles, parenthood, and family structures. This paper analyzes the legal framework governing reproductive rights in the Republic of Serbia, with particular focus on the right to decide on childbearing and the right to access medically assisted reproduction. Through a critical examination of the Constitution, the Family Law Act, the Law on the Procedure for Termination of Pregnancy, and the Law on Medically Assisted Reproduction, as well as the Draft Civil Code, the study identifies key normative inconsistencies and interpretive dilemmas that undermine the legal certainty and effective realization of reproductive rights, especially for women. One of the central issues addressed is the identity of the right-holder of reproductive freedoms—most notably, the freedom to decide on (non-)childbearing. Although Serbian law formally affirms this freedom in gender-neutral terms, a deeper analysis reveals that only women possess the biological and legal capacity to exercise this right in its fullest sense.

Nevertheless, current legislative formulations often obscure this fact, risking a dilution of women's reproductive autonomy under the guise of formal equality. The paper also explores the discriminatory implications of the Law on Medically Assisted Reproduction, particularly the provision that grants access to single women only in “exceptional” cases. This wording introduces a form of indirect discrimination based on marital status, which is not objectively justified and is inconsistent with contemporary understandings of family diversity and gender equality. The aim of this paper is to expose these normative tensions and inconsistencies within Serbian reproductive law and to assess their implications for the realization of gender equality and human rights in practice. The analysis is conducted through a combination of normative legal interpretation and doctrinal critique, with reference to relevant legal scholarship and human rights standards. The findings reveal that the existing legal framework, while formally aligned with the principles of equality and reproductive autonomy, remains substantively shaped by traditional conceptions of gender and family, which continue to limit the scope and accessibility of reproductive rights for women.

2. FREEDOM OF DECISION-MAKING REGARDING (NON-)CHILDBEARING IN THE LEGISLATIVE FRAMEWORK OF SERBIA

Reproductive rights represent fundamental human rights equally applicable to both women and men. However, the freedom to decide on (non-)childbearing can be considered a true component of reproductive autonomy only when women are genuinely free to make such decisions independently, without any form of coercion. From a legal standpoint, these issues are rooted in constitutional guarantees that proclaim the right to freely decide on childbirth. This freedom serves as a clear indicator of the status of women's human rights within the constitutional system and reflects the genuine commitment of public authorities to fully ensure, protect, and enable the exercise of those rights (Pajvančić, 2010:86).

2.1. The Freedom to Decide on Childbirth

The Constitution of the Republic of Serbia from 2006 is among the few constitutions that explicitly guarantee the freedom to decide on childbirth (Pajvančić, 2009:85). Article 63 stipulates that “everyone shall have the right to freely decide on the birth of children” and that “the Republic of Serbia shall encourage parents to decide to have children and shall assist them in doing so.” In guaranteeing this right, the Constitution employs a gender-neutral formulation—“everyone”—which allows for varying interpretations as to who the right-holders are (Pajvančić, 2009:86). In contrast, the Family Act is more explicit regarding the right-holder. Article 5 of the Act provides that “a woman shall freely decide on childbirth.” A comparison of these constitutional and statutory provisions reveals a legal inconsistency, particularly given that the Family Act—which explicitly defines the right-holder—was adopted prior to the Constitution (Pajvančić, 2009:86). This ambiguity is further reflected in the Draft Civil Code, which appears likely to resolve the issue to the detriment of women. Specifically, Article 2216 of the Draft Civil Code states: “a woman, as well as a man, shall freely decide on the birth of children.” Insufficient attention was paid during the drafting process to the broader legal and societal context, as well as to the progressive approach already adopted in the Family Act. Considering that pregnancy biologically occurs within a woman's body, a literal interpretation of the Civil Code's provision—according to which both a woman and a man are equally entitled to decide on childbirth—could lead to the conclusion that a man may legitimately determine when and how often a woman becomes pregnant. Such a conclusion would significantly undermine women's ability to autonomously make decisions concerning a biological and medical process that occurs within their own bodies and which they alone undergo.

2.2. The Freedom Not to Bear Children

An additional issue arising from the linguistic interpretation of relevant legal provisions concerns the concept of the freedom not to bear children. If the freedom to decide on childbearing is recognized as belonging equally to women and men, then, by extension, the corresponding freedom not to bear children must also apply to both. Since the decisions to have and not to have children represent two inseparable aspects of the same right, they cannot be treated in isolation. This raises a fundamental question: can a man exercise the right not to bear children? While this question may initially appear illogical, it becomes relevant if one accepts the premise that men, at least implicitly, are granted such a right. The absurdity of this assumption—as well as of the relevant constitutional and proposed civil law provisions—becomes apparent when examined in light of the legal framework regulating abortion. According to the Law on the Procedure for Termination of Pregnancy in Health Institutions, pregnancy may be terminated solely at the request of the pregnant woman (Article 2), and only with her written consent (Article 9). These provisions clearly affirm that the right not to bear children is an autonomous right belonging exclusively to women. This legislative position is grounded in two key principles. The first is the principle of bodily autonomy, which affirms that a woman must have full and exclusive control over her own body. The second derives from the social position of women, supported by historical and moral reasoning: it is women who bear and care for children, and therefore, it is women who must retain the authority to make decisions regarding contraception, abortion, and childbirth (Konstantinović Vilić, 2010, p. 33). The legislator's decision not to prohibit abortion—and to explicitly recognize women as the sole right-holders—highlights the unsustainability of a broadly defined and gender-neutral formulation of the freedom to decide on (non-)childbearing. The right to abortion is a personal, dispositive, inalienable, and non-pecuniary right that belongs solely to the pregnant woman (Petrušić, 2010, p. 88). Accordingly, a broadly framed legal provision granting equal freedom to decide on (non-)childbearing may be interpreted as a covert attempt to introduce abortion restrictions by indirect means.

2.3. The Right-holder(s) of the Freedom to Decide on (Non-)Childbearing

A review of the preceding discussion suggests that the contested legal provisions concerning reproductive decision-making likely stem from a widespread—yet overly narrow and conceptually problematic—division of reproductive rights into “childbearing” and “non-childbearing.” Such a constrained conceptualization leads to legal ambiguities, primarily through the conflation of terms that are neither synonymous nor legally equivalent. The first doctrinal inconsistency arises from an imprecise and overly broad interpretation of the notions of childbearing and non-childbearing. The second is reflected in legal formulations such as “everyone is free to decide on childbearing” and “a woman, as well as a man, is free to decide on childbearing,” which extend beyond the limits of both biological fact and legal coherence. The third inconsistency is closely linked to the previous two and concerns the interchangeable use of terms such as family planning and parenthood on one hand, and childbearing and non-childbearing on the other—despite the lack of normative or biological equivalence among them. Legal theory commonly defines reproductive rights as comprising at least three core elements: (1) the freedom to decide whether to have children, when to have them, and how many; (2) the right to access information and means for fertility regulation; and (3) the right to bodily autonomy (Mršević, 1994, p. 166). Among these, the right to autonomous reproductive decision-making is considered the foundational component (Petrušić, 2010, p. 84). In Serbian legal doctrine, the term childbearing is often equated with the freedom to decide whether, when, and how many children to have. However, if one adopts a more precise understanding—defining childbearing strictly as the act of giving birth—it becomes evident that childbearing necessarily involves a pregnant woman who brings a child into the world through childbirth.

By definition, this excludes men from being either biological or legal subjects of the act of childbirth. This interpretation is supported by Article 42 of the Family Law Act, which defines the mother as the woman who gives birth to the child. In contrast, fatherhood is not determined by the act of birth but through a legal presumption: the husband of the mother is presumed to be the father if the child is born within a marital union. Within this legal framework, a man may exercise reproductive agency by choosing to avoid unwanted paternity or by pursuing desired fatherhood—for instance, through contraception or medically assisted reproduction in cases of infertility. Nonetheless, since current medical science does not permit male pregnancy or childbirth, men cannot be recognized as legal right-holders of the freedom to decide on childbearing—and, by extension, non-childbearing.

Additional doctrinal ambiguity arises from the use of the term “everyone” in the constitutional provision guaranteeing the freedom to decide on childbearing. Likewise, the Draft Civil Code extends this right to both women and men, despite the biological impossibility of male gestation and childbirth. Such a formulation disregards the natural division of reproductive roles and introduces the risk of legal consequences detrimental to women. By framing reproductive decision-making in terms that are overly broad and biologically inaccurate, the provision threatens to erode legal recognition of women's exclusive reproductive capacities. This expansive interpretation also contributes to confusion between the concepts of family planning and parenthood on one hand, and childbearing and non-childbearing on the other. For example, the constitutional language might be interpreted to imply that any individual—including same-sex partners—has the right to plan a family and become a parent. Such an interpretation is even broader than the Draft Civil Code, which explicitly defines the right-holders as a man and a woman. However, both the Constitution (Article 62) and the Family Law Act (Articles 3(1) and 4) recognize only heterosexual marital or extramarital unions, and do not grant legal recognition to same-sex partnerships.

3. DISCRIMINATION AGAINST SINGLE WOMEN IN THE CONTEXT OF THE RIGHT TO PROCREATE AND THE LAW ON BIOMEDICALLY ASSISTED REPRODUCTION

3.1. Defining Discrimination Under the Law on the Prohibition of Discrimination

When addressing the issue of discrimination, we refer to a fundamental principle that underpins any democratic society (Milenković, 2010, p. 7). Accordingly, the prohibition of discrimination is enshrined at the highest legal level in the Republic of Serbia. Article 21 of the Constitution states: “All are equal before the Constitution and the law. Everyone shall have the right to equal legal protection, without discrimination. Any discrimination, whether direct or indirect, shall be prohibited, particularly on grounds of race, sex, national affiliation, social origin, birth, religion, political or other beliefs, property status, culture, language, age, and mental or physical disability. Special measures that the Republic of Serbia may introduce to achieve full equality for individuals or groups in a substantively unequal position compared to other citizens shall not be considered discrimination.” In addition to constitutional protection, Serbia has enacted the Law on the Prohibition of Discrimination, which serves as a general legal framework aiming to consolidate and harmonize numerous fragmented provisions found in other, often less effective, laws (Milenković, 2010, p. 8). This law defines discrimination as “any unjustified distinction, unequal treatment, or omission (exclusion, restriction, or giving of preference) in relation to individuals or groups, as well as members of their families or persons close to them, whether manifest or covert, based on race, skin color, ancestry, citizenship, national or ethnic origin, language, religious or political beliefs, sex, gender, gender identity, sexual orientation, sex characteristics, income level, property status, birth, genetic characteristics, health condition, disability, marital and family status, criminal record, age, appearance, or membership in

political, trade union, or other organizations, as well as other actual or assumed personal characteristics.” As is evident, the list of protected personal characteristics is not exhaustive. This implies that discrimination may also be based on other attributes not explicitly enumerated, but which the legislator recognizes as potentially common grounds for unequal treatment. The Law recognizes several forms of discrimination, including direct and indirect discrimination, violations of the principle of equal rights and obligations, incitement to discrimination, association for the purpose of discrimination, hate speech, and harassment or degrading treatment (Article 5). For the purposes of this paper, the focus will be on the concepts of direct and indirect discrimination. Direct discrimination occurs when a person or group is placed in a less favorable position based on a personal characteristic, in a comparable situation. It constitutes a manifest and easily identifiable violation of the principle of equality (Article 6). Indirect discrimination, on the other hand, is more subtle and arises from actions or omissions that appear neutral and non-discriminatory at first glance. Such measures may ostensibly respect the principles of equality and non-discrimination, but in effect produce unequal outcomes. Indirect discrimination occurs when a seemingly neutral provision, criterion, or practice places a person or group at a disadvantage due to a personal characteristic—unless such treatment is objectively justified by a legitimate aim and the means of achieving that aim are appropriate and necessary (Article 7).

3.2. Beneficiaries of the Right to Medically Assisted Reproduction and Discrimination Against Single Women

The Law on Medically Assisted Reproduction regulates the methods, procedures, conditions, and organizational framework for the implementation of medically assisted reproduction (MAR), including the types of procedures involved, the realization of the right to access such procedures, oversight of the law’s application, and the performance of relevant administrative tasks, as well as other matters significant to its enforcement (Article 1). Given that the aim of this paper is to highlight discriminatory provisions within the Law on Medically Assisted Reproduction, the following analysis will focus on the provision defining the scope of individuals entitled to access MAR procedures. In this regard, Article 25 of the Law states: “The right to undergo medically assisted reproduction procedures (MAR) is granted to an adult and legally competent woman and man who require assistance through MAR procedures for the treatment of infertility, who live together in accordance with the law governing family relations—namely, spouses or common-law partners—and who are deemed capable of exercising parental responsibilities and are in a psychosocial condition from which it can be reasonably expected that they will be able to fulfill such responsibilities, in accordance with the law and in the best interest of the child. Exceptionally, the right to MAR procedures is also granted to an adult and legally competent woman who lives alone and who is capable of exercising parental responsibilities and is in a psychosocial condition from which it can be reasonably expected that she will be able to fulfill such responsibilities, in accordance with the law and in the best interest of the child.” From the cited provision, it is evident that the Law designates as primary beneficiaries of MAR procedures adult men and women who are in a marital or common-law union, subject to several conditions. Firstly, age is a criterion—minors are excluded from accessing these procedures. Additionally, the couple must be in a marital or extramarital union that complies with the provisions of the Family Law Act. This includes requirements that neither partner is already married to another person of the opposite sex, that both have legal capacity, that the union is entered into freely and voluntarily, and that there is no relationship of kinship, adoption, affinity, or guardianship between them. Furthermore, both individuals must be in a psychosocial state from which it can reasonably be expected that they will be capable of fulfilling parental responsibilities in accordance with the law and in the best interest of the child.

The Law also allows a single woman to undergo MAR, provided she is of legal age and her psychosocial condition indicates a reasonable expectation that she will be able to assume parental responsibilities. However, the use of the term “exceptionally” to refer to single women who seek to become mothers through MAR introduces a discriminatory element. The wording implies that the norm consists of married or cohabiting couples, while single women are seen as deviations from that norm, permitted to access MAR only under special circumstances. As a result, MAR will generally be approved for married or common-law couples who meet the legal criteria, while single women are subjected to a form of selection that remains undefined. The Law fails to specify what additional or special conditions—if any—must be met by single women seeking access to MAR, although the use of the term “exceptionally” clearly suggests that such conditions exist. This formulation prioritizes couples and relegates single women to a less favorable position, which constitutes a form of indirect discrimination. Namely, both couples and single women seek to become parents and require medical assistance to do so. All are adults and are evaluated according to the same psychosocial criteria indicating their capacity for parenthood. The only distinguishing factor is the single woman’s personal characteristic—the absence of a partner—which the legislator appears to treat as a deficiency, implicitly questioning her suitability for motherhood. Such a distinction lacks objective justification. Moreover, this provision does not pursue a legitimate and proportionate aim that would justify differential treatment. In the context of modern society, where single-parent families are no longer a rarity, legal distinctions of this kind appear outdated and unfounded. Consequently, it may be concluded that the provision in question constitutes indirect discrimination based on marital or partnership status.

4. CONCLUSION

The analysis of the Serbian legal framework concerning reproductive rights reveals a complex and often contradictory normative landscape that reflects deeper tensions surrounding gender equality and individual autonomy. While the Constitution of the Republic of Serbia formally guarantees the freedom to decide on childbearing through a gender-neutral formulation, other legislative acts—such as the Family Law and the Law on the Procedure for Termination of Pregnancy—more explicitly recognize the unique biological and legal position of women in exercising this right. These inconsistencies give rise to ambiguities regarding the identity of the right-holder, particularly when viewed in light of the Draft Civil Code, which extends this right equally to both women and men. Such a formulation fails to account for the physiological and legal realities of reproduction, introducing interpretive dilemmas that risk undermining women’s reproductive autonomy. The analysis further indicates that the legislative framework lacks a harmonized and coherent understanding of reproductive rights, which directly affects legal certainty and the effective protection of these rights in practice. Despite the formal recognition of reproductive autonomy, the examined legal texts reveal latent normative tensions between abstract principles of equality and the concrete realities of reproductive health and parenthood. This tension is particularly evident in the regulation of pregnancy and abortion, where the right of a woman to make autonomous decisions is often framed in ways that permit moral, medical, or legal interference. Furthermore, the Law on Medically Assisted Reproduction creates a differentiated legal status between married or cohabiting couples and single women. Although single women are formally included among the beneficiaries of medically assisted reproduction, their access is characterized as exceptional and subject to conditions that remain legally undefined. This legislative design results in a form of indirect discrimination, as it treats single women as less eligible for parenthood solely based on their marital or relationship status, despite their fulfillment of the same psychosocial and legal criteria as couples. The vagueness of these criteria further complicates access and enables a discretionary application of the law.

Taken together, the relevant legal provisions demonstrate that while reproductive rights in Serbia are formally recognized, they are marked by normative inconsistencies and interpretive ambiguities. These issues significantly affect the practical realization of such rights, particularly for women, whose reproductive autonomy remains vulnerable to legal formulations that inadequately reflect their distinct biological role and social position. As a result, reproductive rights exist in a precarious balance between formal legal guarantees and the underlying normative structures that continue to reflect traditional views of family, gender roles, and parenthood. The legal framework thus oscillates between the principles of formal equality and substantive limitations, exposing the fragility of reproductive rights when confronted with broader societal and institutional norms.

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MANAGING NATURAL RESOURCES AND HUMAN CAPITAL FOR ECONOMIC DEVELOPMENT: INFLUENTIAL INDICATORS

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ABSTRACT

Each state's ability to develop economically sustainably depends on its natural and human potential, which typically serves as the foundation for regional and state development. A topic gaining more attention is effectively promoting socially, ecologically, and economically sustainable development. Balanced economic development is the fundamental tenet of economic and socioeconomic development. Because decisions impact corporate success, making decisions is a big duty in the business sector. To develop a suitable strategy for evaluating and establishing priority goals, new approaches to decision-making must be adopted. Numerous techniques for making decisions based on multiple factors have been created, such as the Analytic Hierarchy Process (AHP), which undoubtedly requires more focus. Using a multi-criteria decision-making framework, the article selects influential aspects of managing natural and human resources for sustainable economic growth in Serbia. AHP, interval AHP (IAHP), and fuzzy AHP (FAHP) are the three suitable techniques used. These techniques allow for analyzing findings from many facets of expert opinion. This research examines the AHP approach from multiple angles through a case study, where experts with varying profiles' perceptions are used to identify decision criteria. The results of this study can serve as guidelines for resource management decision-makers to improve regional and economic growth. The four groups (a framework for strengthening participation in development, human social resources, economic resources, and natural resources) are used in the study to explain the elements that affect the management of natural and human resources for economic and regional development. Managers must select the most acceptable of the six scenarios the suggested model presents. A suggestion like this gives the decision-maker enough leeway.

Keywords: *Analytic Hierarchy Process (AHP), Development, Economy, Fuzzy AHP, Interval AHP, Managing, Resources*

1. INTRODUCTION

Each state's ability to develop economically sustainably depends on its natural (though human) potential, typically the foundation of regional and state development [1]. People have survived and advanced economically and generally by molding these potentials to suit their needs. On the other hand, technological advancements, particularly in information and communication technology, have undoubtedly benefited daily life and work. Without them, a modern economy and way of life would be unthinkable.

However, it has also accelerated the depletion of natural resources and the exploitation of the human environment [2]. The Earth that man lives on has altered, but change is happening more quickly now. Despite its tiny size, Serbia boasts high-quality people and natural resources. A topic that is gaining more attention is how to effectively promote growth that is socially, ecologically, and economically sustainable [3]. Serbia's economy is divided into developed areas in the north and less developed areas in the south. Balanced economic growth is the fundamental tenet of general financial and socioeconomic development [4]. Implementing sustainable development and managing human and natural resources have made it necessary to give economic factors more consideration in the future [5,6]. The premise is that intelligent resource exploitation has been the foundation for future economic growth [8,9]. Only by attaining economic growth—which is mostly dependent on people, knowledge, information, education, and the caliber of relationships between individuals and institutions—can South Serbia's economy expand sustainably. Reducing the economic burden of external debt and improving the quality of life, the state of the environment, and the general well-being of society are all necessary for sustainable economic development. This is based on the growth of several important economic indicators, including GDP growth, employment, foreign trade, competitiveness and exports, investment, and household standards [10]. The population puts a lot of strain on the capital, whose territory is always growing, and keeps other cities and regions in the nation from developing in a balanced manner. An increase in gross domestic product, foreign trade development, employment rate, investment, and competitiveness on the global market are all necessary for the region's economy, which has a poor economic structure and limited financial, natural, and technological resources [11]. The concept of a knowledge-based economy has been discussed a lot lately. The Lisbon Strategy of the European Union and the Sustainable Development Strategy of Serbia aim to advance economic growth by establishing an economy that relies on information and education for prosperity [12]. The new phase of social processes poses the challenge of identifying the alternative development path to the public consciousness of citizens, given the need to review the body of experience and appropriately transform the economic management system towards sustainable development. A systematic approach to the sustainable development of the country as a whole, and especially the impoverished south of Serbia, must take into account and consider in a complex way the state, society, people with their knowledge and skills, economy, ICT, and ecology. Specifically, these components have come together to form what is known as a public-private partnership (PPP). To raise the standard of social life, new effective models for decision-making must be created. By using these models, one may establish a strategy for economically sustainable development, predict potential adverse risk occurrences, and reduce them when implementing creative PPP ventures. The four groups (a framework for strengthening participation in the development, human social resources, economic resources, and natural resources) are used in the study to explain the elements that affect the management of natural and human resources for the financial and regional development of south Serbia. To identify important aspects, this study examines the management of natural and human resources for the economic growth and regional development of south Serbia from the perspectives of fuzzy and interval approaches of method AHP and crisp AHP. Managers are interested in developing and practicing trustworthy decision-making techniques now and in the future. Our research aims to demonstrate how useful the AHP method can be when making decisions. One technique for resolving multi-criteria decision-making (MCDM) issues is the Analytic Hierarchy Process (AHP). It indicates the ultimate selection of the optimal solution to the problem under analysis following a thorough assessment of multiple factors [13]. Numerous academics have stated various fuzzy AHP approaches and applications [14]. We applied the Fuzzy Analytical Hierarchy Process (FAHP) method using the three-level optimistic approach and Chang's Extension analysis method (EAM) [15,16]. Using the

example of [17], the findings are compared with the IAHP results. There are four sections in the paper. The introduction offers basic information on the topic within the context of managing human and natural resources for the region's economic development. The second section provides the approach, including interval AHP, fuzzy triangular, and AHP methods. In this section, indicators are selected from four distinct groupings. The ranking results and comparison of the outcomes of the specified algorithms are shown in the third section, along with a discussion. In the final fourth segment, conclusions and future study objectives were offered.

2. RESERCH METHODOLOGY

The objective is to compare the outcomes and identify significant factors from implementing the methodologies. Comparing the degree to which different approaches can affect the selection of influencing elements is the paper's aim (Figure 1).

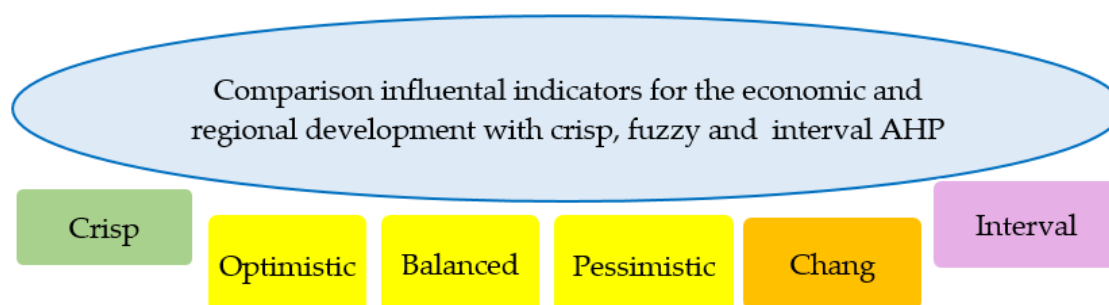


*Figure 1. Approaches in methodology
(Source: Authors)*

It is important to consider the foundation of the research process, the collection of essential actions or processes that successfully conduct the research, before introducing the methodology. This paper uses a six-step research process:

- The framework for managing human and natural resources to promote economic growth
- Review of literature
- Methodology: AHP, triangular fuzzy AHP and interval AHP method
- The presentation of economic development indicators
- Enlisting pairwise comparisons between the outcomes and decision components
- Selecting and ranking important indicators, measures affecting the economic development

AHP is a methodical approach that organizes and analyzes difficult judgments based on subjective evaluation. Its primary benefits are its ability to use many criteria in an understandable and effective manner while handling both qualitative and quantitative data. AHP is a multi-criteria decision-making technique that compares decision-making options for each criterion, highlights the benefits of each criterion, and determines the final ranking of the choice alternatives. Selecting the best option among the available options is the result of AHP. The following procedures are used to implement the AHP technique:

- (1) Breaking down the decision-making problem to establish a hierarchy.
- (2) Making pairwise comparisons to create comparison matrices.
- (3) Calculation of weights and consistency of comparisons.
- (4) Combining weights to rank options and get outcomes.

AHP has been applied in several fields, including engineering, business, and manufacturing. AHP should be used by developing nations to solve complicated economic issues from many development viewpoints [18]. Pairing the available options based on all evaluation criteria is the core of the AHP technique. In the actual world, information or data gathered from specialists typically contains ambiguity and uncertainty that are conditioned mostly by human reasoning errors and decision-making environments that are ambiguous and incomplete. FAHP (Fuzzy Analytical Hierarchy Process) is a more potent approach for multi-criteria decision-making that combines the benefits of fuzzy set theory with AHP. When it is impossible to precisely evaluate (quantify) the influence of indicators on the decision problem, the fuzzy and interval AHP method can solve the multi-criteria analysis problem. Additionally, adopting the FAHP or IAHP (Interval Analytical Hierarchy Process) technique can reduce subjective influences in decision-making.

2.1. Fuzzy AHP method

One well-known mathematical technique from earlier times is fuzzy AHP. The fuzzy AHP method has been applied to rank the criteria —the technique is designed to assist in solving complex decision-making problems.

$F = \{(x, \mu_F(x)), x \in \mathbb{R}\}$, where $\mu_F: \mathbb{R} \rightarrow [0,1]$ is a continuous function, is a specific fuzzy set of fuzzy numbers. The membership function of the triangular fuzzy number (TFN), represented by $\tilde{T} = (a, m, b)$, is as follows:

$$\mu_{\tilde{T}}(x) = \begin{cases} \frac{x-a}{m-a}, & x \in [a, m) \\ \frac{b-x}{b-m}, & x \in [m, b] \\ 0, & \text{otherwise.} \end{cases}$$

The triangular fuzzy numbers (TFNs) include the following symbols and meanings: $\tilde{1} = (1, 1, 3)$ is equal importance (both elements have the same influence); Three $\tilde{3} = (1, 3, 5)$ indicates moderate importance (one element has a slight advantage over the other); five $\tilde{5} = (3, 5, 7)$ indicates strong importance (one element has a strong advantage over the other); seven $\tilde{7} = (5, 7, 9)$ indicates very strong or demonstrated importance (one element has a very strong advantage over the other); and nine $\tilde{9} = (7, 9, 9)$ indicates extreme importance (one element has an extreme (full) advantage over the other). $\tilde{2} = (1, 2, 3)$, $\tilde{4} = (3, 4, 5)$, $\tilde{6} = (5, 6, 7)$ and $\tilde{8} = (7, 8, 9)$ are intermediate values.

The fuzzy AHP approach, which is mostly based on triangular fuzzy numbers, has shown itself to be appropriate in a variety of engineering, environmental, industrial, and economic domains in recent decades. The majority of fuzzy AHP applications employ Chang's extent analysis method because fuzzy weights are more difficult to compute than crisp weights [19]. Similar to AHP, FAHP creates priority vectors, reduces inconsistencies, and allows pair comparisons and decompositions. It also offers a hierarchical framework. Additionally, fuzzy AHP can be applied to a variety of situations and difficulties.

The steps of the algorithm are given in Table 1.

Step 1	Determining the primary objective and the criteria and sub-criteria that support it. Creating the hierarchy of problems.
Step 2	The fuzzy comparison matrices are obtained. A fuzzified evaluation scale has been used for a paired comparison. Using triangular fuzzy numbers, we construct a comparison matrix $\tilde{C} = (\tilde{c}_{ij})_{n \times n}$ for a fuzzy pairwise criteria comparison. Whereby $\tilde{c}_{ij}$ is a fuzzy value that represents the relative importance of one criterion to another. The averaging method calculates the sum of the opinions of various experts.
Step 3	Analysis of the consistency of comparison matrix. For matrix $\tilde{C} = (\tilde{c}_{ij})_{n \times n}$ we compute the consistency index (CI) and consistency ratio (CR) using the formulas $CI = \frac{\lambda_{max} - n}{n - 1}$, $CR = \frac{CI}{RI}$, where RI is an accepted random index of a matrix $\tilde{C}$ and λ_{max} stands for the maximal eigenvalues. We accept evaluated fuzzy elements of the matrix if the CR value is less than 0.10; if not, we must eliminate the causes of unacceptably high estimations and continue comparisons in pairs until the degree of consistency falls within acceptable bounds.
Step 4	The determination of fuzzy synthetic extents. The synthetic triangular fuzzy numbers have been calculated, according to Chang's extent analysis method, by $\tilde{S}_i = (a_i, m_i, b_i) = \sum_{j=1}^n \tilde{c}_{ij} \odot (\sum_{i=1}^n \sum_{j=1}^n \tilde{c}_{ij})^{-1}$, $i = \overline{1, n}$
Step 5	Based on total integral values calculated by [20] $w_i(\tilde{S}_i) = 0.5(\nu b_i + m_i + (1 - \nu)a_i)$, $i = \overline{1, n}$, $\nu \in [0, 1]$, we compare obtained TFNs $\tilde{S}_i$. The optimism index, represented by the real constant ν , explains the decision maker's perspective on risk. Higher risk and lower optimism are indicated by the smaller values. Values such as $\nu=0$ (pessimistic opinions), $\nu=0.5$ (balanced viewpoints), and $\nu=1$ (optimistic viewpoints) were employed in our study.

*Table 1: Steps in algorithms FAHP
(Source: Authors)*

2.2. Interval AHP method

Combining the use of intervals and AHP techniques by applying interval comparison measures in pairs in the AHP technique and the application of the IAHP method is another way to get around the drawbacks of the AHP approach.

An interval $a_{\otimes} = [a^l, a^r] = \{a | a^l \leq a \leq a^r\}$ is an interval grey number. For instance, articles [21,22] present interval gray numbers. Even in the case of the opinion of only one expert, he often cannot decide on a specific numerical value that would express his position on the dominance of one criterion over another. When many professionals are involved, particularly those from many professions, and the problem is multifaceted, the issue becomes more apparent. To get around these issues, interval comparison matrices, where $a^l \leq a^r$, can be used in place of traditional comparison matrices.

In this case, a^l stands for the lower limit and a^r for the upper limit. The Table 2 is an expression for the Interval AHP (IAHP) method:

Step 1	The general objective is defined and identified, and a hierarchical structure is created by identifying the criteria and sub-criteria that support the main objective.
Step 2	The comparison judgment matrix C_{int} creation: $C_{int} = \begin{bmatrix} 1 & [x_{12}, y_{12}] & \dots & [x_{1n}, y_{1n}] \\ [x_{21}, y_{21}] & 1 & \dots & [x_{2n}, y_{2n}] \\ \vdots & \vdots & \ddots & \vdots \\ [x_{n1}, y_{n1}] & [x_{n2}, y_{n2}] & \dots & 1 \end{bmatrix}, \quad i, j = \overline{1, n}, x_{ij} \leq y_{ij}, x_{ij} \geq 0, y_{ij} \geq 0, x_{ji} = 1/y_{ij} \text{ and } y_{ji} = 1/x_{ij}.$
Step 3	The matrix C_{int} examination's consistency. Non-interval matrices $R = (r_{ij})_{n \times n}$, $S = (s_{ij})_{n \times n}$ and $T = (t_{ij})_{n \times n}$ are created from the matrix C_{int}. , $0 \leq \varepsilon \leq 1$. $R = \begin{bmatrix} 1 & y_{12} & \dots & y_{1n} \\ x_{21} & 1 & \dots & y_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ x_{n1} & x_{n2} & \dots & 1 \end{bmatrix}, S = \begin{bmatrix} 1 & x_{12} & \dots & x_{1n} \\ y_{21} & 1 & \dots & x_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ y_{n1} & y_{n2} & \dots & 1 \end{bmatrix},$ $T = \begin{bmatrix} 1 & y_{12}^\varepsilon \cdot x_{12}^{1-\varepsilon} & \dots & y_{1n}^\varepsilon \cdot x_{1n}^{1-\varepsilon} \\ x_{21}^\varepsilon \cdot y_{21}^{1-\varepsilon} & 1 & \dots & y_{2n}^\varepsilon \cdot x_{2n}^{1-\varepsilon} \\ \vdots & \vdots & \ddots & \vdots \\ x_{n1}^\varepsilon \cdot y_{n1}^{1-\varepsilon} & x_{n2}^\varepsilon \cdot y_{n2}^{1-\varepsilon} & \dots & 1 \end{bmatrix}.$ By verifying the consistency of the introduced non-interval matrices R and S, the consistency of matrix C_{int} is investigated. If matrices R and S satisfy constraint $CR \leq 0.1$, and are consistent, then so is the interval matrix C_{int}.
Step 4	Determination of interval matrix weighting vectors. The weights of the interval matrix C_{int} have been determined using the convex combination method using weighting vecors of a matrix T .
Step 5	Interval weights ranking. The final rank is obtained, according probabilities that one weight of the interval is greater than the other, using row-column elimination method.

Table 2: Steps in algorithms IAHP
(Source: Authors)

A few interval mathematics algorithms are shown in [23,24].

2.3. Creating indicators of sustainable economic development

Table 3 lists the four groups of criteria (a framework for strengthening participation in the development, human resources, economic potentials, and natural resources) and their sub-criteria that influence the realization of the concept of managing natural and human resources for the financial and regional development of south Serbia [25].

	(S) – A structure for enhancing involvement in the development
S ₁ - Knowledge- and innovation-based economic development approach	S ₁₁ : Establishing an entrepreneurially attractive environment S ₁₂ : Attracting targeted investment S ₁₃ : Human resource development to meet labor market demands
S ₂ - Sustainable mobility and interactive city development	S ₂₁ : The city's improved accessibility S ₂₂ : The core city zone's sustainable mobility S ₂₃ : Logistics and economic zone development S ₂₄ : The traffic system's adherence to people's needs S ₂₅ : Increasing the proportion of road users who are cyclists and pedestrians S ₂₆ - Improved safety conditions for all road users
S ₃ - Developing and enhancing citizen infrastructure services	S ₃₁ : Enhancing the standard of public infrastructure S ₃₂ : Establishing a structure for superior utilities S ₃₃ : Enhancing communication and information exchange with residents S ₃₄ : Higher efficiency coefficient for each PUC (public utilities commission) separately
S ₄ - Energy capital as a chance for growth	S ₄₁ : Enhancing energy infrastructure S ₄₂ : Increasing energy efficiency S ₄₃ : Institutional framework for energy systems development and high-quality service delivery S ₄₄ : Achieved in the billing system according to the energy consumed
S ₅ - Increased social cohesiveness	S ₅₁ : Quality, diversified, and easily available social services S ₅₂ : Enhancing tourism, sports, and cultural content S ₅₃ : Enhancing the Infrastructure for Social Development S ₅₄ : Social rights and services users now have access to a single record system. S ₅₅ : Adoption of the City Housing Strategy S ₅₆ : Putting investment plans into action for primary healthcare facilities and equipment
	(E) - Economic potentials
E ₁ - A rise in competition	E ₁₁ : Stability of the business sector and business climate E ₁₂ : International reaction to the COVID-19 outbreak
E ₂ - The gray economy's suppression	E ₂₁ : Lowering the GDP's proportion of the gray economy E ₂₂ : Decrease in the proportion of unregistered businesses E ₂₃ : Relative VAT (value added tax) decrease
E ₃ - Public-private collaboration	E ₃₁ : Enhanced economy and efficiency E ₃₂ : Lessening the fiscal strain of public investment E ₃₃ : Increasing foreign direct investment (FDI) levels
	(N) - Natural resources
N ₁ - Planning for the use and preservation of natural resources	N ₁₁ : The National Strategy for using and protecting Natural Resources and Goods is being implemented. N ₁₂ : Strategic evaluation of plans and programs' effects on the environment N ₁₃ : Evaluation of projects' environmental impact N ₁₄ : Comprehensive prevention and management of environmental contamination
N ₂ - The management of both non-renewable and renewable natural resources	N ₂₁ : Reconciliation of the link between the rate of natural resource regeneration and the extent of resource exhaustion N ₂₂ : Resource design based on capital investments, quantity, quality, and structure N ₂₃ : Ecological aspects' direction in the local population's best interests

N ₃ - Using sustainable development concepts to protect resources and ecosystems	N ₃₁ : Enabling the environment to tolerate a specific quantity of contaminants per unit of time and area to prevent irreversible environmental harm; N ₃₂ : How a system, service, or product affects the environment N ₃₃ : Ecosystems and resources themselves are effectively preserved N ₃₄ : Openness and information about the larger local community ts
(H) - Human resources	
H ₁ - The labor market and employment	H ₁₁ : Assistance in creating employment policies at the local and inter-municipal levels H ₁₂ : Improving how employment policy initiatives affect those who are difficult to hire H ₁₃ : The suppression of the unorganized sector
H ₂ -Improving health services' accessibility and quality	H ₂₁ : Encouraging everyone's health and well-being H ₂₂ : Preventive medical care H ₂₃ : Increasing the health system's operational capability by EU norms data
H ₃ - Education	H ₃₁ : Enhancing the value and caliber of adult education and secondary vocational training by the National Qualifications Framework H ₃₂ : Ensuring children at risk have access to and achieve higher education levels H ₃₃ : Universal Education
H ₄ - Inclusion in society	H ₄₁ : Promoting social inclusion in the local community by providing a wider range of social services H ₄₂ -Activation-based support for the shift from social assistance to employment (also known as "welfare-to-work")
H ₅ - Technical support	H ₅₁ : New requests for projects promoting cross-border collaboration are announced H ₅₂ : Completing the Human Resources Development Operational Program H ₅₃ : Talks on a new EU financial perspective and negotiations with specific bilateral donors

*Table 3: Steps in algorithms IAHP
(Source: Authors)*

3. RESULTS

We applied the described algorithms and obtained comparison matrices and corresponding vectors, taking into account expert opinions.

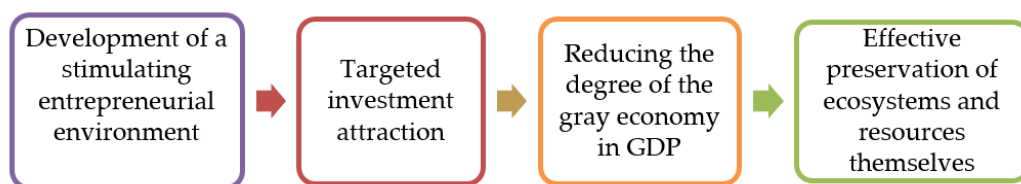


*Figure 2: The most influential factors singled out as measures by IAHP
(Source: Authors)*

Influencing factors as proposed measures by AHP and FAHP

Optimistic scenario (FAHP)	Pessimistic scenario (FAHP)	Balanced scenario (FAHP)	Chang approach (FAHP)	Crisp approach (AHP)
• E₁₁ - Stability of business environment and business sectors • E₃₂ - Reducing the pressure of public investment on the budget • N₃₃ - Effective preservation of ecosystems and resources themselves • E₁₂ - Global response to the COVID-19 pandemic • S₁₂ - Targeted investment attraction • N₃₁ - Creating ability of the environment to accept a certain amount of pollutants per unit of time and space so that there is no irreversible damage to the environment • N₂₁ - Reconciliation of the relationship between the degree of exhaustion of natural resources and their regeneration rate.	• E₁₁ - Stability of the business environment and business sector • S₁₁ - The development of a stimulating entrepreneurial environment • E₃₂ - Reducing the pressure of public investment on the budget • E₁₂ - Global response to the COVID-19 pandemic • S₁₂ - Targeted investment attraction • N₃₃ - Effective conservation of ecosystems and resources themselves • E₃₁ - Increase in efficiency and economy.	• E₁₁ - Stability of business environment and business sectors • S₁₁ - The development of a stimulating entrepreneurial environment • E₃₂ - Reducing the pressure of public investment on the budget • N₃₃ - Effective conservation of ecosystems and resources themselves • E₁₂ - Global response to the COVID-19 pandemic • S₁₂ - Targeted investment attraction • N₃₁ - Creating ability of the environment to accept a certain amount of pollutants per unit of time and space so that there is no irreversible damage to the environment	• E₁₁ - Stability of business environment and business sectors • E₃₂ - Reducing the pressure of public investment on the budget • S₁₁ - The development of a stimulating entrepreneurial environment • N₃₃ - Effective conservation of ecosystems and resources themselves • E₃₁ - Increase in efficiency and economy. • N₃₁ - Creating ability of the environment to accept a certain amount of pollutants per unit of time and space so that there is no irreversible damage to the environment • S₁₂ - Targeted investment attraction	• E₁₁ - Stability of the business environment and business sector • S₁₁ - The development of a stimulating entrepreneurial environment • E₃₂ - Reducing the pressure of public investment on the budget • N₃₃ - Effective conservation of ecosystems and resources themselves • S₁₂ - Targeted investment attraction • E₁₂ - Global response to the COVID-19 pandemic • E₃₁ - Increase in efficiency and economy

Figure 3: The most influential factors singled out as measures by AHP and FAHP
(Source: Authors)

Figure 2, and Figure 3 shows the ultimate order of influencing factors in managing people and natural resources for regional and economic growth by applying IAHP and FAHP

4. CONCLUSION

Under the tenets of sustainable development, managing human and natural resources for economic and regional growth is a worldwide task that demands consideration and significance in every community. Establishing a model for the state's projected growth is part of the region's economic development strategy. The indicators included in the article are categorized into four groups: natural resources, human and social resources, economic potential, and development. The final findings from identifying influencing elements were greatly impacted by the methodology used in evaluating the indicators, which were provided by ambiguous figures and intervals. To determine priorities in resource management and economic regional development, 57 distinct sub-criteria are ranked using AHP techniques, triangular fuzzy AHP, and interval AHP. According to the Chang method and the traditional AHP, the triangular shape of the AHP indicates the significance of environmental and business sector stability for varying levels of optimism. The interval method highlights the importance of promoting the growth of an entrepreneurial environment. The managers are responsible for selecting the most acceptable of the six scenarios the suggested model presents. A proposition like this gives the decision-maker ample leeway.

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APPLICATION OF THE INTEGRATED SYSTEM OF MEASURING THE PERFORMANCE OF BUSINESS SYSTEMS

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ABSTRACT

Contemporary performance measurement systems emerged as a consequence of the acknowledged weaknesses of the traditional measurement system. It is considered that the balanced scorecard is one of the most influential innovations contributing to the transformation of contemporary management accounting discourse and practice, and its occurrence is considered as the most important event for the development of contemporary performance measurement systems. Although, after the beginning euphoria, it was turned out that the design, implementation and development of contemporary systems in a dynamic and turbulent environment, that shape the current era, is not an easy task. The researches show that the companies have many problems during the design, implementation and development of the measurement system and this still fuels the academic debates about the relevance and validity of these systems. After the development of the Balancedscorecard concept, which not only evaluates organizational performance, but also relates it to the defined strategy, and the mass implementation of this system by renowned companies, a significant part of the scientific community assessed that it is one of the most important managerial techniques, and that the problem of performance measurement, in largely overcome. However, subsequent research has questioned the relevance of this system, and it has been shown that its implementation can even cause damage to the company. The paper indicates that judgment and great care is necessary during the design, implementation and development of an integrated system of measures, as well as that it is necessary to ensure a positive attitude of employees, as well as to be aware of the real scope of integrated systems of performance measures.

Keywords: *Balanced scorecard, contemporary performance measurement systems, performance measure*

1. INTRODUCTION

As a consequence of the perceived weaknesses of traditional performance measurement systems, which are based exclusively on financial (accounting) measures, an awareness of the need has developed inclusion of non-financial measures in measurement systems, which resulted in the so-called modern performance measurement systems. The development of the Balanced Scorecard concept in the early 1990s is considered a key event for the development of modern performance measurement systems, and the Balanced Scorecard itself has remained the most popular performance measurement framework to this day. Except for necessities diagnostics, modern performance measurement systems are also promoted as powerful strategic ones tool, which not only enables the translation of strategy into concrete activities, but is also used for just defining the strategy, as well as for subsequent reviews of the adequacy of the adopted strategy. With a more massive application of modern performance measurement systems, especially the Balanced Scorecard, empirical research into the expediency of the implementation of these systems has been made possible. It turns out that the implementation of modern performance measurement systems often does not have the expected results effects, which encouraged research aimed at identifying problems in implementation and the application of modern performance measurement systems, but also a review of the theoretical validity of the framework i performance measurement methodology.

2. SEMANTIC CONTENT OF THE TERM „PERFORMANCE“

Performance measurement and management are the subject of numerous researches. This is the topic are engaged in by researchers from various scientific fields, and the most present among them are from the domain of management accounting, operational management, strategic management and operational research. This field, like hardly any other, is the subject of numerous special editions of the world's most prestigious scientific journals and magazines from the mentioned fields. Obsession with performance results in change multi-decade terminologies from the domain of management. Thus, at the end of the last century, it was stated that the term management control is sometimes considered outdated and is regularly replaced by the term "performance management". Development of strategic systems measurement, i.e. performance management, has led to this term being used today the meaning of organization management. Not only is the term "performance" used with different meanings, but, as they note French authors, this term, which is written equally in English and in French, is found in ova two languages different meaning. Emphasizing the complexity of the term "performance", Boutant and Verdier point out multidimensionality of this term. Referring to French literature, these authors point out that this the term benefits in three senses, primarily in the sense of an objective result, corresponding to ex post evaluation of achieved results; to also be seen as a realization process that integrates the engaged activities for achieving results; and finally, that the term "performance" refers to the subjective the result when it includes the intention of approaching the desired reality, subjective in nature, to express an opinion about the level of achievement or success. According to this last view, understanding performance requires judgment and interpretation and integrates as many dimensions as there are interested parties. Boutant and Verdier believe that there are four basic dimensions of performance, namely: (1) financial; (2) economic; (3) social; and (4) environmental dimension. The financial dimension refers to investor satisfaction and long-term goals companies (innovation and the company's ability to adapt to the environment, profitability of its own capital, competitiveness), the economic dimension refers to the maximization of the property's profitability with ensuring appropriate quality of products, ie services, social dimension, meeting the expectations of employees and the ecological dimension of environmental protection. It is interesting that all previously the exposed interpretations of the term performance differ from the meaning assigned to this term in dictionaries. In our country, the question of the semantic content of this term is usually not even raised.

3. PERFORMANCE MEASUREMENT AND MANAGEMENT AS AN ACHIEVEMENT OF ACCOUNTING AND MANAGEMENT

Management accounting represents information support for decision-making by management. The primary function of management accounting was to develop performance measures as an aid to managers in business planning and control. For many years, the focus was on aggregates financial performance measures related to the organization as a whole, as well as to its segments. Johnson and Kaplan point out that the relevance of short-term financial a measure threatened by rapid changes in technology, shortened product life cycles and innovation in production operations. Reduction in the participation of direct labor and increased importance of intellectual capital i of other intangible resources have made reliance on traditional (financial) performance measures flawed and sometimes harmful. With that, they proposed the introduction of selected non-financial indicators, based on the organization's strategy, which include measures from production, marketing and research and development. The publication of the Balanced Scorecard by Kaplan and Norton in 1992 is considered a key event for development of modern models for performance measurement, and the Balanced scorecard is one of the most influential an innovation that contributed to changing the discourse of contemporary management accounting and practice. The last two and a half decades have been

marked by an effort to develop appropriate performance measurement systems and numerous researches on realistic ranges and limitations of those systems. Most of the research on performance measurement systems comes from three different disciplines: management accounting, operational management and strategic accounting management. Developing the mentioned systems requires cooperation researchers from different scientific fields. Looking at accounting issues in isolation, exclusively reduced to the operational level, without simultaneously considering the strategic aspects of business, Robins he calls it myopia (short-sightedness), which can result in errors in formulation and implementation strategies. Today, most authors, and primarily those who deal with accounting and operational management, is focused on finding solutions, how to ensure connection of performance measurement system with strategy. Management requirements for a performance management system that would be helpful for evaluating effectiveness and efficiency in certain areas, such as production management, marketing and human resources management, led to the aspiration to be in all the mentioned functions develop performance measures. The last few years have seen a proliferation of measurement approaches performance in a range of disciplines, including management accounting, operational management, marketing, human resource management and strategic management. In some cases, researchers drew on the development of related disciplines. Often, the researchers knew which were parallel movements in related disciplines, but with very little cross-fertilization of ideas. Area of performance measurement is not, nor can it ever be, a separate field of academic study, as a consequence of diversity, stating that the most cited researchers in this field deal with different disciplines: accounting, information systems, operational management, operational research, that they are directed to different research questions, that the research is based on different theoretical foundations and that apply different methodological approaches.

4. PERFORMANCE MEASUREMENT AND MANAGEMENT SYSTEMS OF BUSINESS SYSTEMS

Traditional systems for measuring the performance of organizations are usually based on ratings degree of achievement of short-term financial goals. It's been a long time it is known that business decisions cannot be made solely on the basis of financial information. Accordingly, no criticism of the traditional measurement system performances are not recent. It is emphasized that these systems can undermine production competitiveness by encouraging commitment to short-term goals. Besides moreover, it is pointed out the lack of strategic focus, on encouraging optimization on at the local level and the undermining of the continuous improvement system. Kaplan also emphasizes the irrelevance of information derived from the traditional of measurement systems for decision-making, and later with Johnson, and complete the irrelevance of this information for planning and control. Exploring the relationship between traditional performance measurement systems and career concerns of employees in non-profit organizations, recent research confirms that performance measurement has a critical impact on executive management, by potentially obstructing key investments in long-term infrastructure. Realization that traditional performance measures are not sufficient for performance management in modern conditions, as well as the realization of the importance of intangible assets for strategic realization is a consequence of the development of new approaches and models for measuring organizational performance, and is the past 30 years have seen a revolution in performance measurement and management. It is characteristic of these new models that, in addition to financial ones, they also contain non-financial ones performance indicators. It turns out, however, that it is extremely difficult to define and demarcate modern measurement systems performance. To begin with, it should be noted that these systems are mentioned in the literature under different names, which is not surprising since modern performance measurement systems are dealt with by researchers from different scientific fields.

Thus, these systems meet under the names: "integrated measurement systems," "performance" (integrated performance measurement), "comprehensive performance measurement" (performance measurement), "business performance measurement systems" "strategic performance measurement systems" (strategic performance measurement - SPM). On the other hand, more and more often researchers talk about management systems performance, and some mention measuring systems and performance management (Performance Measurement and Management Systems - PMM). These systems are as stated by these researchers, consists of two components, the performance measurement system and the system for performance management. However, we are not talking about some different, or new systems compared to modern performance measurement systems, but only in to the question of separating the characteristics into two systems that the authors of the previous expressions assign to the system for performance measurement. A far bigger problem is that there is no agreement on which systems are considered modern performance measurement systems, as well as whether individual performance measurement systems are operationalized by certain performance measurement techniques or are, what some authors are considered to be techniques, in fact independent systems or concepts, there is no agreement as to what constitutes techniques the content of which system/concept, nor is there agreement on the very definition of individual ones techniques/systems/concepts. The aforementioned controversial issues are not without importance, since they are conclusions about the role and importance of the measurement system performance, that is, about the advantages of their introduction and the potential negative consequences that these systems can cause directly conditioned by the content of individual systems. The need to clarify what is meant by modern performance measurement systems has not gone unnoticed in the literature.

The mentioned problem, apart from creating confusion, makes it impossible to compare the results of numerous studies and drawing conclusions. Most scientists define these systems in the context of their characteristics, and the most important is the use of both financial and non-financial ones indicators, while other authors, apart from the characteristics, point out their role or main processes, with an emphasis on identifying the strategy that has the greatest potential of translating the strategy into concrete activities and the role of evaluating to what extent it is the company achieved the set goals. In the literature, one can even come across the view that the complex nature of modern performance measurement systems cannot be express with one definition. To make the problem worse, not only is it not entirely clear what is meant by modern measurement systems performance implies, but there are even different points of view on what is meant by certain systems (techniques) implies. So, for example, in business practice, and thus also in professional literature, it rules confusion about what Balanced scorecard actually means, i.e. what are the characteristics of Balanced scorecard concept. This problem is mentioned by Kaplan and Norton pointing out that many companies falsely declare that they apply the Balanced Scorecard simply because they use a mix of financial and non-financial indicators. True, the fact that the Balanced scorecard has undergone several modifications, namely that Kaplan and Norton permanently expanded this concept, and the users themselves, once the system was implemented step by step step forward, thereby expanding its scope, makes clearly defining this concept difficult achievable. Systems of multi-criteria main performance indicators in relation to other measurement systems performance also seems highly contested. Nevertheless, the vaguely defined content of modern performance measurement systems does not make the results questionable the largest number of researches, since the subject of research is most often related to the application of Balanced scorecard, or, far more rarely, the Performance Prism. It is widely believed that there are numerous advantages to the introduction of modern measurement systems performance, especially the Balanced scorecard.

Emphasizing the importance of modern measurement systems, some the authors point out that this system for the company is a counterpart to the human nervous system. In general, it is considered that of the appropriate performance measurement systems, organizations can benefit in:

- Strategy formulation, implementation and review;
- Communication of achieved results to stakeholders (interested persons), thus strengthening corporate brand and reputation;
- Motivating employees at all organizational levels, promoting a culture of improvement performance, and encouraging organizational learning.

5. LINKAGES OF PERFORMANCE MEASUREMENT SYSTEMS AND BUSINESS STRATEGIES

Enterprise management is generally defined in literature and practice through three dimensions. They are formulating a strategy, adapting and/or creating an organization and determining a system of measures performance. Problems in practice arise in the implementation of all dimensions, and are especially pronounced in clearly determining the strategy and its fitting into the appropriate performance system. Performance measures should provide a systemic approach translating the strategy into clearly predictable measurable goals, as well as supporting the goal setting itself. It is believed that modern performance measurement systems can be useful in implementation strategies since they help in the formulation of strategic assumptions and in the identification of potential ones problems related to the defined strategy. In the literature in the field of strategic management and modern performance measurement systems that are most often used are called strategic performance measurement systems (strategic performance measurement - SPM), which emphasizes their importance for strategic management. It has already been noted that there is considerable confusion around the very definition of modern performance measurement systems. Therefore, it is impossible to a precise way to talk about the relationship of these systems with the company's strategy. It seems far more correct talk about the relationship between concrete systems and strategy. In the literature, it is often (mostly weak argued) points out that for the purposes of strategic management, the Balanced scorecard represents the most adequate and complete system. Before developing Balanced scorecard, managers lacked a framework for describing strategy, according to Kaplan and Norton, and managers could not implement something they could not describe well. Therefore, simple the act of describing the strategy using strategy maps in the Balanced Scorecard is an outstanding contribution. The strategic map, which forms a set of hypotheses with causal effects, represents a tool for detailing strategies. It's important here point out that the Balanced Scorecard has evolved significantly over time, and that the importance of the Balanced Scorecard for strategic management is not always the same. Namely, Balanced scorecard (BSC type I) is designed as a multidimensional framework for strategic performance measurement in which financial and non financial indicators, subsequently this system was improved by describing the strategy establishing cause-and-effect relationships (BSC type II), in order to present itself today as a means for implementation of the strategy, bringing it into relation with the defined goals, action plans, results and incentives (BSC type III). It is important to point out that the aforementioned opinion on the Balanced scorecard, as the most adequate and complete system, which is prevalent in the literature and often contested. The number of companies that have introduced performance measurement systems in recent years has made it possible conducting more research. The results of certain researches suggest that the existence modern performance measurement system improves the management's discussion about strategy and it helps focus their attention on what really matters to the organization.

Numerous researchers believe that modern measurement systems performance effective mechanisms for (a) involving managers in the formulation and review process strategies (b) facilitating the implementation of the strategy, facilitating its operationalization, that is translating the strategy into concrete actions; (v) encouraging managers to strategize the organization accept as a continuous process; (g) directing actions towards achieving strategic goals. However, the extent to which modern performance measurement systems can influence strategic processes is conditioned by the way in which it is the system designed, developed and how it is used, as well as the cognitive limitations of management. The results of several studies indicate that modern performance measurement systems increase strategic capabilities of the organization, especially in the area of encouraging innovation (new ideas, products and ways of doing work) and organizational learning. Results of research by Bisbe and Otley (2004) indicates that performance measurement systems favor innovative capabilities exclusively in companies with a low rate of innovation, while reducing the innovation of companies with a high rate innovation.

Therefore, there is a link between performance measurement systems and management, but the positive or negative nature of this relationship is uncertain and determined by a number of factors. However, a number of researchers dispute the strategic nature of the Balanced Scorecard framework. Weber and Schaffer (2000) is of the opinion that the Balanced Scorecard can only be viewed as a system for diagnosing performance, ie only as one step towards active management performance.

Given the multitude of measures, managers who would use the Balanced Scorecard as one interactive system, would be overloaded, while strategic supervision of the original premises cannot be taken into account in an adequate way. Exploring the relationship between the Balanced scorecard and strategy on the example of Finnish companies, Malmi (2001) concludes that there is not significant attempts to connect the Balanced scorecard and budgeting, and concludes that the Balanced scorecard it is used more as an information system than as a strategic management system. However, it is indicated that the redefinition of strategies, as a consequence of constant structural change in the environment, not accompanied by a redefinition of the performance measurement system.

While in theory points out that the establishment of a performance measurement system is a key lever for formulating a strategy, its realization as well as subsequent control, and that the measurement system is correctly designed performance one in which performance measures are integrated with strategy, practice indicates a large gap between performance measurement systems and strategy. The strategic dimension of the Balanced Scorecard framework is disputed by all researchers who dispute the theoretical dimension the basis of this concept.

6. LIMITATIONS OF MEASURING AND MANAGING THE PERFORMANCE OF BUSINESS SYSTEMS

After the initial euphoria, and even emphasizing the necessity of introducing modern measurement systems performance, and especially the Balanced scorecard, an increasing number of researchers point out that there are no convincing ones evidence of the benefits of introducing this system, especially taking into account the costs of introduction and maintenance. They state that innovations in performance measurement are the result "innovations and trends", and that measurement systems are adopted because organizations support one the other and want to look modern. It turns out, however, that research that proves success applications of this concept should not always be taken for granted.

So some effort was made to demonstrate the impact of Balanced scorecard, but their approach was largely anecdotal in nature. Speckbacher et al., on the other parties note that many studies suffer from methodological flaws, such as bias in sample selection, low response rate to questionnaires or unreliable assumptions, while Franco-Santos et al., state that the results of certain researches that confirm satisfaction with the performance measurement system should be taken with great caution, since they respondents were mostly people employed in accounting and finance, which are by nature of things biased, since it is from these services that the introduction and development of the measurement system is promoted performance. The absence of the expected positive effect is seen in different ways. While one group of authors highlights practical problems in the implementation and application of performance measurement systems, or more correctly in other words, certain systems, most often the Balanced Scorecard, and lists various abuses or side effects resulting from an inadequately designed and/or implemented measurement system, no disputing the theoretical validity of the concepts, another group of authors is disputing the theoretical validity itself framework and methodology, that is, they dispute the reality of the very assumptions on which the system is based established.

7. PROBLEMS IN THE IMPLEMENTATION AND APPLICATION OF THE SYSTEM

In the literature, it is often pointed out that companies inadequately implement the performance measurement system. In practice, it often happens that the management is not clear about what they are key performance indicators, resulting in the establishment of a measurement system with inappropriate indicators. Ittner and Larcker (2003) state that only 23% of companies from of the examined sample consistently built and tested the causal models that support the measurement system performance. Ittner and Larcker (2003) state that a frequent problem is that companies do not identify i analyze the relevant non-financial measures and that they do not implement appropriate actions, and especially that focus on non-financial measures that are not related to the chosen strategy. According to these authors, the most common mistakes in constituting the system of non-financial measures performances are:

- not connecting the measure with the strategy;
- not checking assumptions about the nature of the link between measures and strategy;
- incorrect establishment of target performance;
- wrong measurement.

Problems related to the implementation of the Balanced Scorecard are often highlighted in the literature. Kasurinen (2002) notes that the Balanced Scorecard is a good populist concept, and that it represents a theoretical reference framework but that Kaplan and Norton did not provide any help in overcoming the difficulties in the implementation. This is in agreement with Tayler's (2010) view that the implementation is Balanced The scorecard concept is under-researched. Stating different types of identified obstacles in the implementation process of the Balanced scorecard, Kasurinen (2002) highlights the lack of time and resources as a potential problem, since not everyone is in the organization ready to invest enough time and funds to implement the project. In addition, he states that resistance can also arise due to the perception of individuals that the Balanced Scorecard threatens their interests. Implementation problems Balanced scorecard concepts faced by Scandinavian companies, Madsen and Stenheim are classified into four groups: (a) conceptual problems; (b) technical problems; (c) social problems; and (g) problems of a political nature.

Table 1. Four categories of problems in the implementation of the Balanced scorecard concept

Problem Type	Problem	Explanation
Conceptual problems	Contextualization	Balanced scorecard represents a "general model" that can be difficult to adapt
	Causality	Organizations have difficulty understanding and testing causal relationships
	Strategic maps	Organizations have difficulty understanding how to implement strategy maps
Technical problems	Technical aspects	Organizations have problems with data collection and automation
Social problems	Organizational culture	Balanced scorecard may be incompatible with organizational culture, for example not accepting measurement
	Participation	Employees may be passive or block the implementation process
	Commitment	Lack of commitment from central participants in the organization, such as top management or the project group
Problems of a political nature	Time and resources	Implementation. A balanced scorecard requires significant time and resources
	Responsible person	The organization does not have a person who implements the implementation project
	Continuity	Continuity of the project may be threatened due to changes in the scope of work
	Resistance	Employees are resisting the implementation of the Balanced Scorecard

Source: Madsen and Stenheim, 2014, pp. 123-124

In the literature, it is emphasized that the problems related to the implementation and use of modern systems can reduce by involving employees in the design and development of the system, by establishing challenging set but achievable measures of performance and goals and meaningful introduction of rewards (bonuses) in connection with them, as well as by supporting an effective communication mechanism, which encourages feedback information, dialogue and employee participation. They are in the literature identified and certain circumstances, which adversely affect the success of the adequate implementation and use of performance measurement systems, such as organizational culture dominated by engineers or direct management of the organization from by his/her owners.

The cultural characteristics of the nation, as well as the organizational culture which has a significant impact on the acceptance and development of the Balanced Scorecard framework.

8. CONCLUSION

As a consequence of observing the shortcomings of the traditional performance measurement system based on exclusively on financial measures of performance and identifying the negative impacts of such application system, several measurement systems have been developed which, in addition to financial ones, also include non-financial measures. These systems, and especially the Balanced Scorecard, have been attracting the attention of researchers for more than two decades as well as practitioners. Unlike the traditional model of performance measurement, which is primarily oriented towards performance diagnostics, modern performance measurement models, and especially the Balanced Scorecard as the most polar framework, are promoted as powerful strategic tools that facilitate processes (re)defining and realizing the strategy, providing a systematic approach to translating the strategy into a clear one predictable measurable goals. Wide application of modern performance measurement systems in practice, above all, the Balanced Scorecard, enabled numerous empirical studies of the impact of these systems on performance, and especially testing the expediency of introducing these systems for strategic purposes management. It turned out, however, that the introduction of non-financial performance measures is not always beneficial a consequence of the expected benefits, and occasionally even negative consequences are manifested. Inconsistent conclusions about the impact of the application of modern performance measurement systems have been imposed researchers, not only the need to identify problems, i.e. limitations in implementation and application of modern performance measurement systems, but also the need to review the theoretical validity framework and methodology for performance measurement. Despite numerous well-argued criticisms of the Balanced Scorecard, it's hard to disagree stating that the importance and impact of the Balanced Scorecard framework should not be underestimated. As a framework and concept, the Balanced Scorecard has inspired a generation of practitioners and members academic community. The current challenge is to improve this framework. If in that fails, we are in danger of falling into the trap of applying solutions in the present proposed to solve the problems of the past.

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LEVERAGING AI CALL CENTERS AND THE 3I STRATEGY FOR TRANSFORMING BUILDING MAINTENANCE IN SERBIA: CHALLENGES AND OPPORTUNITIES

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ABSTRACT

The transformative nature of legal entities in housing communities aims to simplify maintenance and financial management; however, challenges arise in operational decision-making and compliance with the law. Artificial intelligence (AI) call centers provide a direct, natural language processing solution by automating service requests. In the research, we used mixed methods that included a combination of quantitative analysis of performance metrics and qualitative feedback from the created AI call center. Based on the perceived possibilities of applying the 3I strategy, we presented a new model of the organizational pattern of behavior of all intermediate process actors (OPHPS). Using a methodological approach, we have established operational procedures for user service providers in housing communities. Innovative efforts drive the development of smart tools for maintenance and efficient communication in various circumstances. Applying an AI and 3I strategy ensures connectivity with existing management infrastructure, enabling real-time updates and optimization of work orders. The focus of the research is on our presented OPHPS method, with the help of which continuous improvements in service quality are established and operational costs are reduced. We believe that the economic sector of building maintenance in Serbia can be improved through the application of the mentioned methods. By adopting methodological solutions, the challenges of the availability of managers of housing communities can be overcome throughout the day.

Keywords: facility management, predictive maintenance, AI call center, building maintenance, 3I Strategy and smart systems

1. INTRODUCTION

In our research work, we want to enable a more precise application of sustainable development and other issues of importance for housing policy by implementing the law on housing and building maintenance [3]. The ultimate goal is to preserve the housing stock of real estate owners. The transformation of housing communities into legal entities enabled a legal policy that, among other things, refers to the necessary investment and ongoing maintenance, which will enable the creation of the necessary payment fund for buildings [16]. We have noticed that the application of building maintenance is a complex given framework due to the different requirements and preferences of citizens [16, 20]. More effective communication between tenants and authorized licensed managers is possible, as well as the cancellation of errors during the posting of the inflow of financial resources on the accounts of housing associations, and can be realized using artificial intelligence (AI). AI assistants have a technological potential that ensures a more relaxed cognitive feeling for service users by raising the standards of the business environment and securing communication regardless of changes in the market [6, 9]. The research uses mixed methods that involve a combination of quantitative observations of performance metrics and qualitative feedback from operators. The call usage timeline is implemented by employing performance measurements to collect operator stress levels and customer satisfaction scores. Comprehensive data is collected six months before and after using the AI system [26]. The 3I's strategic approach to integration, innovation, and improvement is an

essential factor for AI implementation and optimization in call centers. 3I strategies represent an innovative strategic framework, as they consist of the refinement of AI optimization tools within the framework of specific needs for building maintenance and the management of residential communities.

Chatbots serve tenant calls and automate efficient announcements of operational activities. The inclusion of AI in complex software maintenance systems with the application of IoT, CI/CD, cloud, quality standards, and many others [8, 10, 11, 15] implies incorporation into existing software complying with legal frameworks and reducing the shortcomings of operational tasks [5, 12, 14]. AI systems can improve correct decision-making and compliance with standards and laws. Through the delivery of adequate services and optimizing the allocation of scarce resources [7] through constant improvement based on data. Reflections on AI technologies with operator experiences are sublimated through semi-structured interviews, and the results point to the improvement of the comprehensive capabilities of call centers. The equivalent of reducing the time interval of using calls is greater satisfaction of consumers, i.e., customers, and lower levels of operator stress. A good score allows the AI system to automate repetitive tasks and assist in communicating with consumers in real-time. Sustainable research is focused on long-term observation and implementation of AI, creating satisfaction for operators and the entire economic activities of producers and consumers [1]. Realized contributions are found in section 6, where the specific contribution is found in the sub-section 6.1, which represents the contribution of the organizational form of housing communities, managers, and professional services called OPHPS. Seeing a clearer picture of our research work, we created a research framework that is structured into several sections, each of which individually covers a specific thematic aspect as follows: Section 1 presents the basic research idea and introduces the research problem. Section 2 defines and explains the research method that is applied within the work. Section 3 presents the connection of professional managers with legal regulations. Section 4 explains the 3I strategy (integration, improvement, innovation). Section 5 contains challenges in the implementation of AI call centers related to the financial costs of its implementation. Section 6 gives the results of the application of AI technologies to call centers, creating more efficient systems that complete the implementation of the assigned operational activities of managers. Section 7 summarizes the analyses performed and the shortcomings of the research questions that were previously defined within the research method. Section 8 in the conclusion, we talk about the benefit of applying AI and the 3I strategy to the building maintenance sector in Serbia as a positive aspect.

2. MATERIALS AND METHOD

In the research work, we used the Prisma checklist method [23], which comprised eligibility, acceptability, or reporting requirements for the specified articles employed in our research investigation. Then, we used the sources of information that we described in the paper. Based on the Prisma method specification, we used steps 8, 9, 10, 11a, and 11b for the selection and creation of the research method.

2.1. Selection Criteria

The initial basis for the selection of relevant literature was realized based on the topicality of the research topic. The selection process was carried out based on the use of segments of research works that are in line with the trends of sustainable housing.

2.2. Keywords

Based on the following keywords, we have chosen the appropriate literature:

1. Professional manager,
2. Residential Community

3. Creating a call center using AI

2.3. Formulation of research questions

The use of AI-enabled call centers in building management and maintenance is gaining momentum due to its ability to streamline operations and improve service delivery. To better understand the impacts and technological sector challenges, the following questions are suggested:

2. How can AI call centers improve operational efficiency in building maintenance?
3. What challenges arise when integrating AI systems into existing asset management frameworks?
4. How does AI affect tenant satisfaction and communication in residential buildings?

The questions in these topics seek to explore the practical benefits and potential challenges of applying AI technology in property management, particularly in terms of increasing communication, reducing costs, and improving the tenant experience.

3. LAWS AND LEGAL FRAMEWORK

The package of legal frameworks related to housing and maintenance of buildings not only imposes questions about the organization of cancellation of defects, replacement of worn-out elements, repairs of old ones, and maintenance of common premises but also represents a responsible operational undertaking, including administrative procedures, analysis of legal obligations, and rights of tenants. There are questions related to the steps in decision-making, questions of responsibility, control of financial resources through the budget of legal entities, i.e., buildings, and adequate functioning by following the law. At the end of 2016, at the proposal of the Ministry of Construction, Transport, and Infrastructure of the Republic of Serbia, the Law on Housing and Maintenance of Buildings ("Official Gazette of RS", No. 104/2016) was adopted. It began to be applied on January 1, 2017 [20]. This is how the prerequisites for improving the management and maintenance system of residential buildings were obtained. Implementation of efficient management of housing communities required that they carry all rights and liabilities as legal entities in entire legal transactions. By sublimating the three legal regulations that regulated the maintenance of residential buildings and social housing in previous times, there was no adequate application and compliance of legal possibilities with the then economic trends and social environment [20]. The Permanent Conference of Cities and Municipalities, as a participant in the drafting of the law, observed that the issues of non-maintenance and constant deterioration of housing stock belong to the local level of sustainability. Back in 2014, she advocated for the reform of the housing stock maintenance system, so the presidency of this association created and adopted the Platform for reforming the entire system of maintenance of buildings owned by several persons. It resulted in important topics that were implemented in the new law related to the obligation of management and maintenance, professionalization by including professional managers, as well as a more precise influence of local self-government on the implementation of legal solutions [3].

3.1. Goals of passing the Law

The objectives of the implementation of the Law on Housing and Building Maintenance refer to increasing the value of the housing stock. The impact of new trends is reflected in people's conscience, a higher degree of energy efficiency through a more efficient degree of use of the resources of the Housing Community. Concerning the previously unenforced laws on housing, new trends provide better quality, more sustainable housing in every sense [24]. The set goals of raising the standard of living in Housing Communities are made possible by the application

of the competencies of professional managers, which are defined and reviewed in Article 53 of the Law on Housing and Building Maintenance [21].

3.2. Professional manager powers

To present the role of professional managers, it is necessary to examine the operational tasks and responsibilities over the assigned Housing Communities and their cadastral plots in accordance with the aforementioned Article 53 of the Law on Housing and Building Maintenance. Following the above, the professional administrator takes care of the land from the cadastral plot belonging to the building, covers the regularity and implementation of the law [21]. Based on the public debate, a possible new law will bring changes in the area of competence of professional management organizers.

The impossibility of implementation and non-compliance with the Labor Law, the provision of which prescribes the obligations of the professional manager to receive reports of malfunctions in the period from 00-24 hours, which is physically impossible, was observed. The reception of malfunctions that require urgent intervention, especially at night, must be adequately ensured by organizing reception through call centers, which is primarily an obligation of the organizer of professional management. At the same time, the wording of the obligation related to emergency interventions is also changing, because the professional manager cannot ensure the execution of these works, but rather organize their execution [19]. Artificial intelligence (AI) is responsible for the transformation of companies in various industries. Digitalization is increasingly present in economic activities, in addition to the presence of scalable processing power, increasing availability of information, and constant improvement of advanced machine learning (ML) techniques.

4. 3I STRATEGY-INNOVATE, INTEGRATE, IMPROVE

The future of building maintenance in Serbia, as well as raising professional management to a higher level of organization and efficiency, is linked to the strategic approach of 3I (integration, improvement, innovation). The process of including technologically intelligent system maintenance approaches such as more energy-efficient lighting, recording of financial transactions, and twenty-four-hour coverage of residential communities with citizen calls, represents an unstoppable part of the progressive nature of the use of AI. By using digital options, many operations in the professional management of Housing Communities can be relaxed and service providers can specialize in this domain in general [22]. Maintenance of functional operability is related to the cooperative maintenance of buildings, human resources, and financial operations. Greater efficiency is achieved by signing contractual obligations between licensed service providers (in this case, building managers), complying with Serbian legislation, and making decisions based on relevant data. Service providers in economic sectors using analytics and automation provide better services and allocate resources more efficiently [4, 22]. AI optimization is improved through regular business audits, feedback mechanisms, and a strategy to reduce operating costs. In the management of buildings, inspections are necessary to reduce problematic situations and stressful situations, and initiatives for the functioning of the system are adapted to ecologically sustainable housing. Greater performance of residential buildings, reduction of operating costs, and long-term more efficient solutions are possible by continuous inclusion of feedback systems and inclusion of new technological solutions [4, 22].

5. CHALLENGES IN APPLYING AI CALL CENTERS

We have listed the benefits of using AI when maintaining buildings and organizing their management. However, some obstacles exist, which we shall discuss, and these are related to the deployment of new technology. Namely, the integrative process of combining AI technologies

and a complex building management system can be complex and long-lasting. The specialization of professional staff in the economic branch of building maintenance is a critical point of the system. A systemic convergence of humans and AI with the common goal of asset management is necessary. The financial costs of using smart technologies represent one of the barriers to smaller companies, entrepreneurial activities in fund management. These are short-term difficulties that should be overcome in the long term by improving operational efficiency, lowering costs, and relaxing complex challenges in business. AI call centers are necessary in the urban environment of housing stock management because they can process large amounts of information related to service operations and various tenant issues, creating efficiency, better dynamic activity related to twenty-four-hour service coverage. The benefits are reflected in the continuous maintenance of communication with the tenants of Housing Communities, extending to urban areas where the population is large (an example of a Housing Community with over 100 registered tenants). AI can establish personalized communication that relies on tenant data, creating an environment of greater trust and relaxing sometimes tense situations. The initial financial costs of adopting AI technologies represent an aggravating circumstance for smaller companies or entrepreneurial businesses that are trying to take good positions in the market and have limited financial budgets. Significant costs include the tools and infrastructure to install the software and hardware necessary for AI to work. The improvement of human resources for the efficient management of tools and adaptation to new technological circumstances may require a certain time interval, which may create a temporary interruption in the provision of services. The AI system uses a lot of data from apartment owners to provide personal services, which is a problem because it conflicts with data security and privacy laws. Keeping your data secure and private is important because there is a lot of concern about violating privacy laws. Increasing application refinement will integrate IoT and AI call centers, providing better solutions for building maintenance and customer and tenant satisfaction. AI can be used in addition to automating tenant inquiries, managing inventory, and scheduling operational activity in real time, prioritizing maintenance based on the building's current needs.

5.1. AI Call Centers

AI call centers improve the professional management and maintenance of buildings in Serbia by automating service requests, streamlining communication, and enabling predictive maintenance. They use machine learning and natural language processing (NLP), and within this framework, different aspects related to dopamine in the end users have to be looked at [13, 25] to effectively solve the questions sent by the tenants and to classify the problems related to maintenance [17]. By combining artificial intelligence with building maintenance systems, a call center can deliver real-time system performance updates, predict equipment failures, and arrange repairs in advance [17]. This reduces downtime and operational costs while increasing tenant satisfaction. AI-based sentiment analysis can help analyze customer satisfaction and create data-driven service improvements [2, 17]. AI-based analytics can improve the control of operational tasks performed by humans by classifying priority tasks based on their urgency and resource availability. Analyzing the alignment of service activities and automatic reporting provides a framework for compliance with Serbian legislation, which includes standards and rules [2, 18].

5.2. Significant improvements in operational management efficiency

The process of including call centers with AI has shown the improvement of operational activities in building maintenance, greater efficiency, and satisfaction of tenants. Reducing the response time by up to 30%, AI call centers were able to automate various customer requests by forming priority lists. The interaction between service users (tenants) and AI has been raised to a higher level of realization by analyzing issues and providing timely updates on the building maintenance status.

IoT and AI-based integration has improved predictive maintenance options, creating an environment for more proactive resolution of operational requirements by tenants, and reducing unexpected operational costs by up to 20%. The systemic ability of AI to optimize the allocation of resources and minimize downtime in work activities by analyzing data from previous interactions paves the way for further progress in housing stock maintenance.

5.3.The latest trends in technology with AI-powered call centers

AT&T began offering call-friendly services that relied on touch-tone dialing in the mid-1960s. They contained innovative functions such as call waiting, call forwarding, three-way service, or conference calling. Automated data collection systems such as digital inquiry/voice response (DIVA) have emerged. Bell engineers have designed different workflows of daily "infrastructure" in several different domains, such as retail, banking, and personal use [27].

6. RESULTS

The results of the application of AI technologies to call centers enable a more efficient system that complements the more expedient implementation of assigned operational tasks performed by building managers.

Coverage of systemic deficiencies in communication between users and providers of building maintenance services is one of the main requirements that must be solved through the application of an appropriate innovative method. In the next section, we present the model that describes the results of the above in more detail. The mentioned section represents the organizational form of Housing associations, managers, and professional services with the abbreviation OPHPS.

6.1.Organization form of Housing communities, managers and professional services (OPHPS)

To explain the role of AI in the processes from the requests of consumers or service users (in our case, tenants) to the provider of adequate assigned operations, we presented a model of the organizational pattern of behavior of all interprocess actors. We have defined an innovative organizational pattern of Housing Communities, Managers, and Professional Services (OPHPS). OPHPS is shown in figure 1.

The mentioned Figure 1 contains a proposal for the needs of Housing Communities. Using a methodological approach, we analyzed and observed the steps in operational procedures based on the provider of user services and the demand for the same. In Figure 1 we have classified the following steps into three divided zones that refer to:

1. Tenants of Housing Communities, 2. Professional managers and 3. Various services or private companies:

Step 1: tenants as service users can use the service in the form of a call center or artificial intelligence, which is covered by operational work twenty-four hours.

Step 1.1 presents several different housing communities that are under the jurisdiction of professional managers.

Step 1.2: Tenants have the option to call professional managers around the clock. The daily working time of 12 hours is reserved for managers' responses to calls from residents of Housing Communities.

Step 1.3: the remaining twelve hours of the night work regime are diverted to emergency interventions or in special situations, the AI transfers operational tasks to managers who are ready to solve the task when necessary.

Zone two: the professional manager in his jurisdiction and operations includes steps 2.1 and 2.2. where the professional manager in the first case for step 2.1 realizes the assigned operations. The remaining 12 hours are covered by the call center in charge of emergency calls, which can be redirected as needed to managers or transfer postponed operational tasks for later.

Step 2.3: arises based on realized calls that require direct intervention by professional managers.
 Step 2.4: involves the processing of collected information by the AI call center, based on which the manager performs further delegation and performance under the responsibilities. In case of need, call the determination of the professional service or the Housing Association from step 1.1
 Step 3.1: implies direct contact of the manager or professional manager with the appropriate professional service that can be in charge of various tasks such as Water supply and sewerage, City housing, Heating, Police, and private companies.

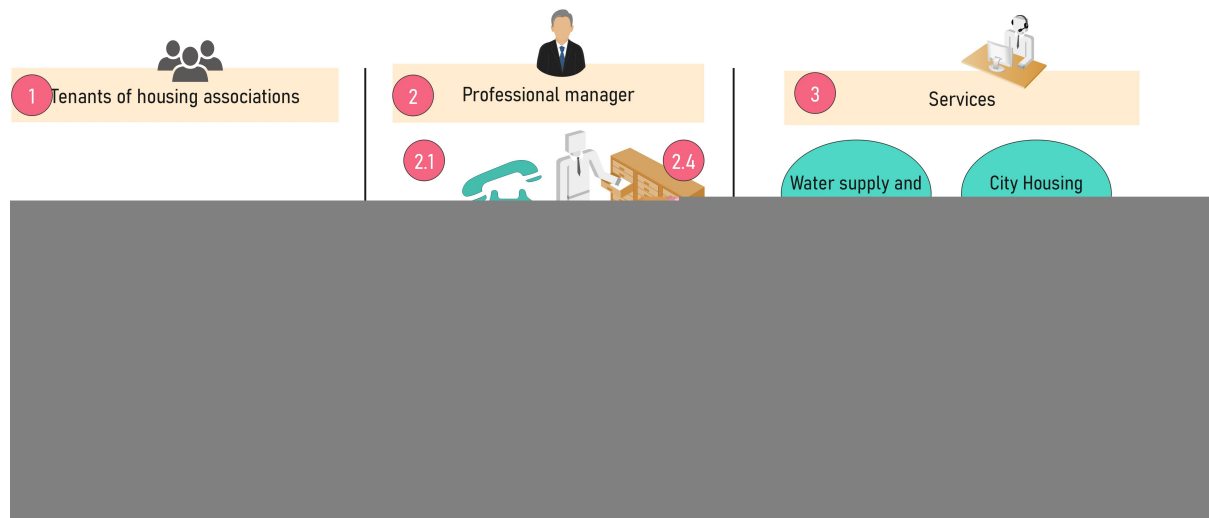


Figure 1: Organizational pattern of Housing communities, managers, and professional services (OPHPS). Source: author's contribution.

The gradual integration of artificial intelligence into economic systems and different segments of industries is particularly relevant to call centers that rely on operational activities. The accuracy of providing adequate feedback by people facilitates the concrete maintenance of housing communities. The ability of natural language processing (NLP) and machine learning enables AI to understand, interpret, and provide adequate responses to service consumers. New technologies provide call centers with the automation of simple tasks, creating efficiency, reducing human errors, and supporting support systems that can process large amounts of service requests. AI chatbots provide personalized interactions by analyzing the information and preferences of service users. The joint approach of AI with IoT (Internet of Things) leads to forecasting processes in various industrial branches, especially in the management of residential buildings. This refers to the possibility of noticing possible problematic situations that have not yet appeared in real time. AI call centers analyze consumers' sentimentality and, through the prism of understanding emotions, refine responses and improve their satisfaction. The processing of more complex voice requests of service customers by AI becomes more precise, which implies future expectations related to the possibility of more perfect automation, a greater degree of personalization, and greater integration with existing economic operations.

7. ANALYSIS AND DISCUSSION

Through the realization of the entire research, we had the opportunity to become familiar with the possibilities of improving call AI call centers. We have opened a discourse for equivalently

providing more effective perspectives in the maintenance of residential buildings in Serbia and relaxing the challenges of traditional methods of business organization. We looked at AI technologies that can automate various service activities and operations, reducing human errors and achieving greater dynamics of assigned operations. The integration of AI smart system solutions enables quality assistance to administrators in real-time by reducing downtime and improving infrastructure and housing stock. Following the previously posed research questions within the research method, we present the following answers:

7.1. RQ1

Looking at the first research question, we can determine that AI call centers can effectively improve operational efficiency by integrating with I3 strategies. We had the opportunity to see the AI capabilities in processing a large amount of data necessary for the operational activities of the organization.

The main contribution was reflected in the possibility of defining a more precise operation and feedback in order to solve more complex tasks, creating greater satisfaction among service users.

7.2. RQ2

We have seen that challenges in building management can be seen in the short term, as there are hardware and software costs that present barriers to small and large businesses. Specifically for the research question, we familiarized ourselves with the frameworks regarding the requirements for security and protection of personal data processed by AI.

7.3. RQ3

Based on the third research question, we had the opportunity to obtain more pragmatic solutions to operational tasks. However, there is a need for research and consideration of user experiences for a long period as part of future research. Following the above, the current experiences are positive in the short term, and the possibilities are variable in the long term. The integrative features of AI call centers with 3I strategies provide greater potential for improving the maintenance and organization of housing stock management in Serbia, regardless of the barriers of financial costs, downtime, and the adaptation of engaged employees.

8. CONCLUSION

The implementation of AI and the 3I strategy in the building maintenance sector in Serbia offers significant benefits in terms of efficiency, compliance and quality of services. However, the successful implementation of the given framework will involve overcoming obstacles such as system integration, staff training, and early financial costs. With ongoing innovations that include software, an integrative approach, and improvement of operational tasks can be realized. Based on previous information and our OPHRS methods, a more sustainable and adaptable asset management system can be enabled. In today's digital age, AI call centers are critical for supporting customer service across all industries, including asset management. Automating everyday tasks allows human resources to focus on more complicated problems. AI contact centers improve tenant communication with Housing Association managers, speed up problem-solving, and provide consistent, round-the-clock support. The ability to manage massive amounts of data and streamline operations makes them key to the modern, efficient management and preservation of the Residential Building stock, which is the stated goal. Future research should concentrate on creating tools with artificial intelligence adapted to the specific requirements of sustainable housing in Serbia. One of our future assessments is the increased long-term impact of AI call centers on tenant satisfaction and reduced business operating costs. Research should also consider the scalability of AI solutions across building sizes and types, taking into account variations in resource availability.

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THE FUTURE OF INTERNATIONAL FINANCE: HOW DOES MULTIPOLARITY AFFECT GLOBAL CAPITAL MARKETS?

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ABSTRACT

The rise of multipolarity in international relations is significantly reshaping global financial markets, influencing capital flows, interest rates, and investment strategies. Geopolitical shifts, including the reconfiguration of economic alliances, trade conflicts, and de-dollarization, present both challenges and opportunities for financial actors worldwide. This paper examines how the redistribution of economic power affects market volatility, investment inflows and outflows, and the monetary policies of major economies. Special attention is given to the role of emerging financial centers, the growth of regional markets, and the potential of digital currencies in redefining the global financial ecosystem. By analyzing empirical data and recent trends, this study assesses the long-term implications of a multipolar order on the stability and predictability of international finance, aiming to provide insights into possible future scenarios for global capital markets.

Keywords: *economic stability, geopolitical changes, global financial markets, interest rates, investment flows, multipolarity*

1. INTRODUCTION

The contemporary international financial system is undergoing profound structural changes driven by the growing multipolarity in global power relations. Following a period of dominance by the United States and its G7 allies, the role of other centers—particularly China, India, Russia, and countries of the Global South—is becoming increasingly prominent (Subacchi, 2020). Multipolarity, as a concept denoting the presence of multiple relevant actors on the global stage, is no longer solely a political phenomenon but has direct implications for capital flows, monetary policies, and investment patterns. The reshaping of the global economic landscape is reflected in escalating trade tensions, dedollarization efforts, and changes in the structure of international financial institutions (Ocampo, 2017). Capital markets are becoming more volatile, and investment flows are shifting from traditional centers—such as New York and London—toward emerging financial hubs in Asia and the Middle East (McKinsey Global Institute, 2023). In this context, the rise of Shanghai, Hong Kong, Dubai, and Singapore as key regional centers clearly signals a transition of the international financial system toward a multi-centered structure. Alongside geopolitical shifts, technological innovations are profoundly impacting the nature of financial flows.

The development of central bank digital currencies (CBDCs) and the expansion of cryptocurrencies challenge traditional mechanisms of capital control and raise questions about the role of the dollar in international transactions (BIS, 2021; IMF, 2022). These changes not only increase the complexity of the system but also open space for a more inclusive and potentially more resilient global financial order. Within this context, key research questions arise: How does multipolarity affect the stability and predictability of global capital markets? In what ways are investment flows being redistributed? How are central banks and international financial institutions adapting to new challenges? Does digitalization bring more stability or additional risk? The aim of this paper is to analyze the impact of multipolarity on global financial markets through three key dimensions: the redistribution of financial power, its influence on investment flows and market volatility, and the role of new instruments and digital currencies in shaping the future order. By utilizing secondary sources, international statistics, and institutional report analyses, this paper seeks to provide an overview of contemporary trends and offer possible scenarios for the evolution of the international financial system.

2. MULTIPOLARITY AND CHANGES IN THE GLOBAL FINANCIAL ARCHITECTURE

The rise of multipolarity in international relations is profoundly transforming the existing financial system, which for decades was based on the dominance of Western institutions and the U.S. dollar as the primary global currency. This shift is not merely quantitative—in terms of greater inclusion of developing countries—but also qualitative, as it challenges fundamental assumptions about stability, predictability, and hierarchy in international finance. Various actors are increasingly involved in shaping new rules of the game, creating an architecture that is less centralized, but potentially also less coherent. This chapter examines three key aspects of this transformation: the geopolitical backdrop and the end of the unipolar order; new forms of economic connectivity and dedollarization; and the redistribution of global financial power between traditional and emerging actors.

2.1. Geopolitical Context: The End of the Unipolar Order

The end of the Cold War and the dominance of the United States in international finance marked a unipolar period that shaped the global order during the 1990s and early 2000s. However, in recent decades, there has been a marked shift toward multipolarity, in which multiple states and regional alliances influence global capital flows, economic norms, and market regulation (Subacchi, 2020). The emergence of new economic powers such as China, India, and BRICS member states has diminished Western dominance, creating a dynamic but also fragmented international financial system. China, as the most significant challenger to the existing order, is not only investing in infrastructure and technological development through its Belt and Road Initiative but is also expanding the global influence of its currency—the yuan (Ocampo, 2017). Meanwhile, trade tensions between the U.S. and China, along with sanctions used by the West as a foreign policy tool, are accelerating the formation of alternative financial channels and allied blocs.

2.2. Economic Alliances, Trade Tensions, and the Process of Dedollarization

Multipolarity is further reflected in the strengthening of regional economic alliances—such as the Regional Comprehensive Economic Partnership (RCEP), the Eurasian Economic Union, and increasing cooperation within the BRICS group. These alliances aim not only at trade and investment integration but also at the gradual reduction of dependence on the dollar in mutual transactions (International Monetary Fund [IMF], 2022).

The dedollarization process, although still limited in scope, is gaining momentum through bilateral agreements on the use of local currencies, the creation of alternative payment systems (e.g., China's CIPS), and the growing share of gold reserves in the portfolios of central banks outside the West (Bank for International Settlements [BIS], 2021). These trends clearly indicate attempts to diversify currency risk and reduce exposure to political pressures linked to the dollar.

2.3. Redistribution of Global Financial Power

Multipolarity does not only imply the existence of multiple political centers but also entails a redistribution of financial power. The share of developed economies in global GDP and capital markets is gradually declining, while the share of emerging markets and regional financial centers is on the rise. According to a report by McKinsey Global Institute (2023), over 50% of global capital growth in the past decade originated from Asia, and investment flows are increasingly directed toward infrastructure and technology projects outside the traditional Western core. This shift in the structure of the financial system is also prompting adjustments in the institutional framework—such as attempts to reform the International Monetary Fund and calls for the creation of new financial institutions that more accurately reflect the interests of developing countries.

3. CONSEQUENCES OF MULTIPOLARITY ON CAPITAL MARKETS

Multipolarity in the global economy not only transforms institutional and currency frameworks but also profoundly affects the very dynamics of capital markets. As more countries and economic blocs shape their own financial policies and standards, capital markets are facing increased complexity, fragmentation, and uncertainty. Capital flows are becoming more susceptible to geopolitical tensions and regulatory differences, while investors increasingly respond to nonlinear risks. This chapter analyzes three key aspects of these changes: volatility and investor behavior, the impact on interest rates and monetary policy, and the transformation of investment flow patterns.

3.1. Volatility, Risks, and Investor Behavior

Rising multipolarity intensifies geopolitical risks, which are increasingly reflected in the markets through short-term price fluctuations, rapid portfolio shifts, and growing demand for safe-haven assets such as gold or government bonds from developed economies. Investors are increasingly adopting hedging and diversification strategies through exotic currencies and illiquid markets to shield themselves from unpredictable shocks (Chinn & Ito, 2022). For example, during the conflict in Ukraine and the imposition of financial sanctions on Russia, significant daily losses were recorded in emerging markets, accompanied by a surge in the prices of U.S. bonds and gold (BIS, 2023). Such behavior highlights the growing connection between political decisions and market perceptions of risk, with multipolarity introducing a new dimension of volatility that is not exclusively tied to macroeconomic indicators.

3.2. Impact on Interest Rates and Monetary Policies of Leading Economies

Monetary policies no longer function in isolation within national economies, but are instead shaped by an increasingly complex global context. In a multipolar environment, central banks of leading economies—such as the Federal Reserve (FED), the European Central Bank (ECB), and the People's Bank of China (PBOC)—must frequently balance domestic priorities (inflation, unemployment) with the global repercussions of their decisions. For instance, the FED's restrictive policies during 2022–2023, which led to a rise in benchmark interest rates, triggered substantial capital outflows from emerging markets, increased the cost of servicing dollar-denominated debt, and exerted additional pressure on the currencies of countries without alternative financing access (IMF, 2023).

At the same time, multipolarity complicates global monetary coordination, as there is no unified platform to align different fiscal and monetary approaches (Eichengreen, 2020).

3.3. Investment Flow Dynamics: Capital Inflows and Outflows

Multipolarity is also reshaping the directions of global capital movement. Investments no longer flow solely toward “safe” Western markets but increasingly follow geoeconomic interests, political alliances, and regional integrations. Capital is now more frequently directed toward Asia, Latin America, and Africa, particularly into sectors such as infrastructure, digitalization, and green energy (UNCTAD, 2023). On the other hand, heightened geopolitical tension and legal uncertainty in some regions result in sudden capital outflows, further destabilizing local markets. Investors demand greater transparency and legal security, while developing countries attempt to attract capital through tax incentives and bilateral investment protection agreements. On a global level, investment flows are becoming more dispersed but also more vulnerable to short-term shocks.

4. NEW TRENDS: REGIONAL MARKETS AND DIGITAL CURRENCIES

Multipolarity not only alters the distribution of political and economic power, but also encourages the emergence of new financial structures grounded in regional markets and technological innovation. The shift of financial gravity away from traditional centers, along with the rapid development of digital technologies, is transforming how capital is accumulated, transferred, and valued. This change creates a dynamic and less predictable financial ecosystem, while also opening space for greater inclusivity and system resilience. This chapter explores three key trends: the rise of financial centers outside the Western core, the role of digital currencies and financial innovations, and the challenges and potential for stability in the new multipolar order.

4.1. The Rise of Financial Centers Beyond the Traditional West

Over the past two decades, financial hubs such as Shanghai, Dubai, Hong Kong, Singapore, as well as São Paulo and Johannesburg, have experienced significant growth in trading volumes, the number of financial institutions, and global investment influence. These cities are becoming competitive with traditional centers like New York and London by offering lower costs, more flexible regulations, and strategic geographic positions (Z/Yen Group, 2023). For instance, Shanghai is increasingly positioning itself as a hub for trading yuan-denominated bonds and derivatives, while Dubai and Abu Dhabi are cultivating reputations as safe zones for Islamic finance and green technology investments (PwC, 2022). These shifts contribute to the deconcentration of global capital but also raise new challenges regarding the harmonization of regulatory frameworks and transparency standards.

4.2. The Role of Digital Currencies and Technological Innovation in Finance

One of the most dynamic aspects of the new financial reality is the rise of digital currencies and distributed ledger technologies (blockchain). Central Bank Digital Currencies (CBDCs) are gaining prominence as responses to the challenges posed by private cryptocurrencies and the need for secure, efficient payment systems. For example, China has already launched the e-CNY as a pilot project, while the European Central Bank is developing the concept of a digital euro (Bank for International Settlements [BIS], 2022). In addition, decentralized finance (DeFi) enables direct capital exchange without intermediaries, significantly lowering transaction costs. Technological innovations are also transforming risk analysis processes, automated investing, and identity verification (World Economic Forum, 2023). However, these systems also carry risks, particularly in areas of regulation, security, and infrastructure stability.

4.3. Prospects for Stability and Resilience of the International System

Although fragmentation and digitalization offer greater flexibility, they also encourage uneven development and asymmetric risks. The global financial system faces a dual challenge: maintaining stability amid geopolitical tensions and integrating innovations that are still institutionally unregulated. Multipolarity can enhance system resilience by diversifying capital sources and decentralizing power—but only if certain levels of international coordination are achieved. Without that, there is a risk of creating “financial islands” that are not interoperable (Ghosh, Qureshi, & Sugawara, 2021). Initiatives such as international standards for CBDCs, shared platforms for data exchange, and regional supervisory structures could help preserve stability.

5. CONCLUSION

The rise of multipolarity is fundamentally reshaping the contours of the international financial system. This paper has shown that the end of the unipolar order—dominated by the United States—opens up space for a redistribution of power through the strengthening of regional economic centers, diversification of investment flows, and innovations in monetary technology. Shifts in geopolitical dynamics—such as trade conflicts, dedollarization, and the formation of new economic alliances—have a direct impact on capital markets, interest rates, investor behavior, and the structure of global liquidity. The analysis has demonstrated that multipolarity intensifies volatility and the perception of risk among investors, particularly in the context of sanctions, currency shifts, and geopolitical uncertainties (Chinn & Ito, 2022; BIS, 2023). At the same time, central banks of major economies face the growing challenge of coordinating monetary policy in an increasingly complex international environment (Eichengreen, 2020). Investment flows are no longer linear or stable; rather, they respond to political signals and regional integration processes (IMF, 2023; UNCTAD, 2023). One of the most important findings of this paper is the emergence of new financial centers and digital currencies that are redefining the role of intermediaries and the very concept of money. Financial hubs such as Shanghai, Singapore, and Dubai are no longer peripheral—they are becoming key providers of liquidity and innovation (Z/Yen Group, 2023). Simultaneously, central bank digital currencies (CBDCs) and decentralized finance (DeFi) are transforming the fundamental principles of payments, financial accessibility, and control (BIS, 2022; World Economic Forum, 2023). Despite its many potentials, the multipolar financial world also entails serious risks—from regulatory fragmentation to increased information asymmetry and institutional inconsistency. The lack of global coordination and standardization may result in the creation of parallel, incompatible financial systems, weakening the resilience of the global economy in times of crisis (Ghosh, Qureshi & Sugawara, 2021). Given the complexity of these processes, more empirical research is recommended on the interaction between digital currencies and capital flows, as well as the effects of dedollarization on international macroeconomic stability. Policy formulation should aim to strengthen mechanisms for international cooperation, build regional stabilization funds, and regulate digital markets in accordance with global principles of transparency and consumer protection. In conclusion, multipolarity is not merely a geopolitical shift—it represents a systemic transformation of international finance. If it evolves alongside appropriate institutional innovations, it could contribute to a more inclusive, resilient, and equitable global financial system.

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CRYPTOCURRENCIES AND THEIR IMPACT ON THE FUTURE

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ABSTRACT

The subject article deals with the impact of cryptocurrencies on the future of financial and banking stability, the SWIFT system and the economy, as well as the attitudes of countries and some international institutions towards them. In today's world, we are witnessing the rapid development and digital technological revolution in all economic, financial and banking streams. This has led to the emergence of new monetary instruments that are compatible with the development of society and the spread of the Internet. Many financial, commercial and economic crises, epidemics and other factors contributed to the introduction of cryptocurrencies. The introduction of cryptocurrencies brought a series of challenges and risks associated with their use, such as money laundering, terrorist financing and trade in illegal goods, as well as challenges related to legal and regulatory issues that harm the economy, financial and banking stability in many countries. There are two research questions addressed in this paper: 1) Do virtual currencies have the same standards as money in its current form? 2) What are the implications of using virtual currencies? The scientific objective of this research is to describe and scientifically explain the main components of virtual currencies as a form of monetary policy and identify the challenges they face. The social goal of the research is to present future prospects for their use to the scientific and social public based on the views of countries, international organizations and central banks on the issuance of virtual currencies and to point out possible obstacles in their proper application. Almost all basic methods of knowledge and research were used in the preparation of the article. Of the general scientific methods, the statistical and comparative method was applied, and of the data collection methods exclusively the method of content analysis of the documents listed in the list of used literature.

Keywords: *Virtual currencies, electronic money, mining, financial stability, Bitcoin*

1. INTRODUCTION

Today, the world is witnessing a rapid development of a technological digital revolution on all economic, financial and banking trends, resulting in the emergence of new monetary tools commensurate with the development of society and the spread of the Internet, and virtual cryptocurrencies trying to take a place for them in today's world, and it has also helped to go to many financial, commercial, economic, epidemics, etc., but there is a set of challenges and risks that result from dealing with it, such as the crime of money laundering and operational financing Terrorist and trafficking in non -legal goods, in addition to legal and regulatory problems, which will harm the economy and banking financial stability in countries.

Add to this the dependence of virtual currencies on the technology of accuracy is the technology of the series of blocks or what is known as (block chain¹), and it is a relatively immature technique and can create many problems as much as the solutions it provides. What has been presented so far is a series of main ideas about emerging technologies and how we can deal with them in a rapidly changed world. Through this study, researchers try to find out the concept of virtual currencies, their characteristics and challenges to use them in transactions now. And its impact on financial, banking and economical stability, with an indication of the opinion of some countries and international organizations in dealing with them. And the future horizons for it.

2. WHAT ARE VIRTUAL CURRENCIES, THEIR ORIGINS, TYPES, AND CHARACTERISTICS

The global monetary system is witnessing multiple developments, the most prominent of which relates to the emergence of cryptocurrencies. Despite the global concerns they have raised, they have gradually begun to gain the trust of some online users. However, the use of virtual currencies remains limited in many regions of the world. This may be due to the lack of support for these currencies from monetary authorities and the difficulty most individuals have access to their production and use². This section explains the concept of virtual currencies, their origins, and the extent of their similarity to cash, their types, and their characteristics.

This is explained as follows: The concept of financial intermediation, accepted by individuals and even countries in modern transactions, has changed. Some people believe there is no longer a need for a third party in business transactions, such as banks and others. This has led to the recent emergence of block chain technology (distributed ledger technology), which has many applications. Among the most important of these applications are virtual currencies, the most famous of which is Bitcoin, which does not require a third party in transactions³. These virtual currencies have come in a completely different format from what exists in cash transactions⁴. Through this requirement, the first hypothesis can be tested, which is the existence of a direct relationship and similarity between virtual currencies and traditional or electronic money. This requirement is studied through the Concept of Virtual and Digital Currencies.

2.1. The Concept of Virtual and Digital Currencies

Before explaining the concepts of virtual and digital currencies, it is important to clarify that currency is considered by the state as money, but it has the force of law in its capacity as a means of acquitting debts. In other words, money is more comprehensive than currencies, as it includes paper money, banknotes, and commodity money, unlike currencies, which have no value unless supported by the force of law and recognized by states. We explain below the concept of money and digital and virtual currencies to determine the validity of the first hypothesis, as follows:

¹ United Nations, (Block chain) Technology and Sustainable Growth United Nations, 9 November 2021.

² Central Bank of Jordan/National Payments System Supervision and Control Department, Study entitled "Cryptocurrencies," March 2020, p. 5.

³ Ashry Muhammad Ali, "Central Bank Digital Currency and Its Inevitable Impact on Monetary Policy," Scientific Journal of Economics and Commerce, Ain Shams University, 2020, p. 405.

⁴ Muhammad Jamal Zain, Abdul Basat Jassam, "Bitcoin Virtual Currency: Its Legal Status and the Ruling on Dealing with It," Journal of Legal Sciences, College of Law, University of Baghdad, Volume 35, Issue 2, 2020, p. 144.

- *The Concept of Money*: Money is an important and fundamental means of our contemporary economic life, as no contemporary society can do without it. It is a useful economic commodity that meets needs and settles obligations arising from transactions⁵. Money is a commodity of exchange, not a commodity of production or consumption. Therefore, it facilitates the circulation of trade, and without it, all transactions and exchanges become complex. Money has a long history, having been invented by groups, and its emergence is linked to the emergence of the barter economy. Barter was the first means of exchange between people. It then evolved into digital or electronic money, which is a cash value stored on a prepaid electronic medium. It is widely accepted by those other than those who issued it⁶.

This necessitates clarifying the concept of digital currencies through the following:

- *The Concept of Digital Currencies*: Digital currencies are considered by some to be the primary umbrella term that encompasses all other forms of currency, whether electronic, virtual, or encrypted. Regardless of the other names they may be called, the primary characteristic of these currencies is that they are available digitally and do not have a tangible physical presence, although they have some characteristics similar to physical legal tender. International organizations and central banks may differ on the definition of digital currencies. Some restrict the definition to a specific form and activity, while others expand the concept and make it inclusive of all forms of currency traded and dealt with over the internet, regardless of the modern technological means used to provide these currencies⁷. Some also argue that the ruling on electronic money is the same as the ruling on legal tender money, as it merely converts the usual form of money into electronic units using technological means.

- *The Concept of Virtual (Encrypted) Currencies*:

Encrypted virtual currencies are defined as currencies that have no physical existence and can be exchanged for currently used official currencies, such as the dollar and the euro. They are traded over the internet without a central authority or central bank behind their issuance⁸. Some define them as monetary value stored on an electronic means, prepaid and not linked to a bank account. They are widely accepted by those other than their issuer and are used as a means of payment for various purposes. The Dutch Central Bank defines it as a currency that operates outside the official monetary system. It is a representation of monetary value not issued by the central bank or credit institutions. Its value is derived from the trust in its voluntary acceptance. It can be described as a private virtual currency that is traded over the Internet through a specific network. It can be collected, transferred via email, or even stored as electronic files on a computer's hard drive. It is also a decentralized electronic currency that uses a peer-to-peer network, electronic signatures, and encryption to prove and enable users to carry out currency transfers and trading operations over the Internet without relying on an intermediary or trusted third party such as banks⁹. It is also used in buying and selling operations or converting it into other currencies, and is voluntarily accepted by those who deal with it.

⁵ Ahmed Gamal El-Din, Musa, *Monetary and Banking Theories and Systems and Financial Markets*, Dar Al-Nahda Al-Arabiya, Cairo, 8th edition, 2021, p. 10.

⁶ Sayed Taha, *Money, Banking, and National Income*, Faculty of Law, Cairo University, 2021, p. 3.

⁷ Habiba Abdelli, Nour El-Din, *Money Laundering in the Electronic Environment*, International Virtual Scientific Conference, Combating Corruption in the Electronic Environment, Arab Democratic Center for Strategic, Political and Economic Studies, Germany/Berlin, April 2021, p. 63.

⁸ Abdul Fattah Muhammad Salah, "Bitcoin: A Cryptocurrency That Could Cause a New Global Economic Crisis," *International Journal of Islamic Economics*, Center for Islamic Transactions Research, Syria, Issue 33, p. 34, 2021.

⁹ Baraa Munther Kamal, Enas Baha, "The Position of Arab Legislation on Virtual Currencies," *Tikrit University Journal of Law*, College of Law, Iraq, Volume 5, Issue 1, Part 2, p. 5.

Researchers believe that these multiple definitions suggest that some people tend to consider virtual currencies a type of digital currency. However, as the majority believe, virtual currencies are intangible currencies, meaning they have no physical existence. They are created via internet connection and rely on advanced, encrypted technology. They are not issued by a local or international monetary authority, meaning they are not recognized. They rely on voluntary acceptance by both parties and are not linked to a bank account. Therefore, it is necessary to clarify the distinction between virtual currencies and digital currencies as follows.

2.2. Virtual Currencies Compared to Digital Currencies:

Some consider virtual currencies a product of the digital revolution, representing a form of digital or electronic money available in the virtual world. They are produced by computer programs and stored in electronic wallets. Therefore, all virtual currencies are digital, while not all digital currencies are considered virtual¹⁰. In 1998, the European Commission defined electronic money as monetary value stored electronically on an electronic medium, such as a card or computer memory, accepted as a means of payment by providers other than the issuing institution, and made available to users for use as an alternative to paper money, with the aim of effecting electronic transfers of payments of a specific value¹¹.

Linking the definition of digital money to its issuer excludes cryptocurrencies from being considered money simply because they are not issued by the issuer of the digital money, even if they constitute monetary value stored electronically for the purpose of conducting payment transactions accepted by a person or legal entity other than the issuer of the digital money. Researchers believe from the above that digital currencies or electronic payment instruments, regardless of their form or usage, are neither money in the conventional sense nor virtual currency.

Their value lies in the balance, i.e., the cash amounts contained therein, and the privileges granted by the legal monetary authority or the entity authorized to issue them, whether a bank or other entity. Even if issued without a bank account, the important thing is that the issuing entity guarantees the payment method. Virtual currencies, on the other hand, are not guaranteed by any official entity and are not subject to regulation by official bodies, meaning they are not legally regulated.

They can be defined as follows, It is the process by which individuals or entities can communicate over the internet using a technology to issue a new encrypted means or currency for a specific purpose, whether buying or selling goods or services personally, subject to the rule of consent and acceptance, using internationally recognized currencies to complete this process without resorting to official banking authorities. The different points between digital and virtual encrypted currencies can be clarified in the table 1.

¹⁰ Farida Haddad, Abd Alhak Qrimes, "Virtual Currency in Algerian Law," Algerian Journal of Legal and Political Sciences, Volume 58, Issue 3, 2021.

¹¹ Nahy Khaled Issa, Israa Khadir Mazloum, "The Legal System of Electronic Money," Journal of the University of Babylon, Humanities, Volume 22, Issue 2, 2022.

Table 1: The different points between digital and virtual encrypted currencies

Comparison Point	Cryptocurrencies	Virtual (crypto) currencies
It has a specific value	It has a specific monetary value.	It has no specific monetary value. It is a virtual currency whose value depends on other legal currencies.
Legal cash cover	Money is stored and transferred electronically.	It has no legal cash cover.
Centralized production	Produced centrally and owned after production or as a result of owning legal tender.	There is no centralized production.
Storing funds in it	Funds are stored electronically, where the cash value is charged to an electronic device such as a card (such as a debit card, MasterCard, Visa, or other forms of electronic payment) or any electronic wallet within mobile phone applications.	The methods of storing funds in it depend on the mining method, algorithms, or any of the mechanisms through which the encrypted virtual currency is produced and owned.
How to exchange it and what is the competent authority?	It is exchanged through an infrastructure subject to the oversight and supervision of an official central authority responsible for the settlement and exchange process between the two parties known to the authority.	It is exchanged without the oversight of a central authority and without the knowledge of the two parties involved. It relies on modern, advanced technology, with no trust between the two parties, and without mediation, meaning no intermediary.
The relationship between the source and the consumer	The relationship between the source of electronic money and the consumer is a contractual relationship.	It is based on anonymity, meaning the two parties are not known. It is based on confidentiality.
Fulfilling Obligations	Electronic money is a form of electronic payment and is valid for various purposes.	It is not suitable for fulfilling all obligations, but rather is used to purchase certain goods and services. It has not gained the trust of individuals or even countries.
Acceptance	Accepted by all individuals and institutions.	Not accepted by all individuals, institutions, or even countries.

Table prepared by researchers

The table shows a clear difference between digital or electronic currencies and virtual currencies in many respects, whether in terms of issuance, acceptance, or legality. Therefore, the first assumption that there is a direct relationship and similarity between virtual currencies and cash in its traditional or electronic form is invalid. Therefore, it is necessary to examine their origin, formation, or issuance through the following requirement to clarify this difference.

3. THE ORIGIN AND FORMATION OF VIRTUAL CURRENCIES, THEIR TYPES, AND CHARACTERISTICS

Virtual currencies have begun to spread among most countries around the world, to the point that Amazon, the website specializing in selling books and publications, announced that it offered more than 2,000 publications on new virtual currencies in 2014 alone. This is a strong indicator of the growing global interest in these currencies, their dominance, and the interest of societies around the world¹². Unlike online payment systems, they are based on decentralized peer-to-peer networks that allow for proof and transfer of virtual currency ownership without the need for an intermediary.

¹² Hassan Mohammed, Bitcoin and its Role in Financing Terrorist Movements, Comments, King Faisal Center for Research and Islamic Studies, August 2020, p. 2.

Given that monetary systems change over time, the distinction between money and non-money becomes blurred, and depends largely on the purpose of the transaction. In this section, we will learn about the origin and formation of virtual currencies, their purpose, their types, and their various characteristics.

3.1. The Origin of Virtual Currencies

The idea of virtual currencies emerged from a computer programmer using the pseudonym Satoshi Nakamoto. He introduced it in a 2008 publication titled "Bitcoin: A Peer-to-Peer Electronic Cash System." This research outlined how Bitcoin works and how it protects against counterfeiting and double-spending¹³. Bitcoin provides a solution to eliminate third-party intermediaries, such as financial institutions and banks, especially during the global financial crisis. Some have stated that the identity of the creator of Bitcoin remains unknown. Whoever invented the virtual currency, Bitcoin was created based on the concept of the block chain, in a study titled "A Peer-to-Peer Electronic Cash System"¹⁴. Over the internet, using free software, complex calculations are performed and extracted through the Bitcoin mining process. The resulting output is then transferred to the block chain, a digital ledger, to become a ready-made, protected digital currency and converted into an asset in a digital financial wallet. This currency is then traded over the internet¹⁵. Currency transactions between users are monitored and the process is documented with an electronic signature that cannot be forged, changed, or deleted, without recording any personal data.

3.2. Creating Virtual Currencies

Virtual currencies are created through mining, which is carried out by miners. The mining process is not limited to a central authority or specific individuals; it is available to everyone, anywhere in the world. However, it requires time and a fast, high-spec computer that consumes enormous amounts of energy, allowing the download of the free mining program, Bitcoin Miner. Using this program, a number of puzzles can be solved, called algorithms, which are a set of mathematical, logical, and sequential steps necessary to solve a problem. After these algorithms are solved, the program issues Bitcoin and adds it to the electronic wallet of the miner¹⁶. This mining process is called mining. It consists of a special application that the user installs on any computer. The application slowly produces new coins, through which the user can obtain virtual currencies. Mining isn't limited to a specific entity or individual; it's available to everyone, as previously mentioned. However, it requires time and a fast computer with specific specifications. The more mining operations are performed, the more difficult the puzzles become¹⁷. Each transaction is recorded in a public ledger called block chain, which includes information about the accounts used in mining and the number of currency units exchanged. This information is stored in each user's wallet, and an electronic signature is added to the transaction. After a few minutes, the transaction is verified and stored in an anonymous, encrypted form.

¹³ Asim Adel Muhammad, "Virtual Digital Currencies: A Path to Financing Terrorism," *Al-Zaytoonah University Journal of Legal Studies*, Jordan, Volume 1, Issue 1, 2020, p. 34.

¹⁴ Abdullah Ahmed, "The Reality of Bitcoin and the Ruling on Dealing with It (A Comparative Jurisprudential Study)," *Journal of the Faculty of Islamic Studies for Boys in Aswan, Al-Azhar University*, Issue 3, November 2020, p. 2477.

¹⁵ Anwar Othman, "The Economic Implications of Block chain Technology and Financial Stability in Arab Financial Markets," *Arab Monetary Fund*, November 2021, p. 6.

¹⁶ Dr. Suwailihi Nour El-Din, "The Impact of Bitcoin Mining and Virtual Currencies on the Stability of the Global Monetary System," *Scientific Horizons Journal*, Amin Al-Aqal Al-Hajj Musa University Center, Volume 10, Issue 2, Algeria 2021, p. 226.

¹⁷ Taher Al-Sadiq, "The Spread of Digital Currencies in Light of the Coronavirus Pandemic: Bitcoin as a Model," *Dafater Bouadis Journal*, Algeria, Volume 10, Issue 101, p. 433, 2021.

Mining occurs approximately every ten minutes, and mining requires high costs, represented by the cost of the equipment and the electrical energy used to issue a single unit of virtual currency. It's worth noting that most cryptocurrencies operate on three main pillars: encryption for authentication, a peer-to-peer exchange protocol (Blockchain), and a virtual currency value determined by the open market, just like the exchange rate between various global currencies. The volatility of virtual currency prices is a major factor in undermining user confidence and the growth of this production system. The system lacks a central administrative authority, so price fluctuations are due solely to changes in market demand. 14 million units have been produced so far, with 35 Bitcoins currently being produced around the world every 10 minutes¹⁸.

3.3. Ways to Obtain Virtual Currencies

- They are obtained by purchasing them from websites or online platforms specialized in selling these currencies online. This is an easy method available to anyone. Simply create an online account and an electronic wallet on your computer or even your phone using available applications, and pay for the unit to be purchased in any currency, such as the dollar. This method is considered easy, accessible, and available to everyone¹⁹.
- They originated and existed through what is known as mining, a very difficult and complex method that not everyone can perform. Mining is called mining or mining, similar to the process of extracting gold from the ground, but using highly advanced computers²⁰.
- They can be obtained through automated teller machines (ATMs) specifically designed for virtual currencies. The first ATM was installed in the Canadian city of Vancouver. Bitcoin ATMs have spread to many countries, reaching 55, with the number of machines reaching approximately 953 by the end of 2016²¹.

3.4. Types of Virtual Currencies

There are dozens of types of virtual currencies. The importance of each digital currency is determined by the number of users, the structure of each network, and the locations where it is exchanged. Based on the market value of coins, the virtual currency scene is crowded, especially since it is a rapidly evolving topic that interests many stakeholders. The number of virtual assets has increased, reaching 5,500 currencies in July 2021. Ultimately, it is impossible to accurately estimate the number of virtual currencies due to the lack of a law regulating their issuance or a specific authority responsible for their issuance. This also explains the varying degrees of usage²². We outline some types of encrypted virtual currencies to clarify the differences between them in terms of issuance, use, and spread among users. These types include:

¹⁸ Taher Al-Sadiq, "The Spread of Digital Currencies in Light of the Coronavirus Pandemic: Bitcoin as a Model," *Dafater Bouadis Journal*, Algeria, Volume 10, Issue 101, p. 433, 2021.

¹⁹ Asim Adel Muhammad, "Virtual Digital Currencies: A Path to Financing Terrorism," *Journal of Al-Zaytoonah University of Jordan for Legal Studies*, Jordan, Volume 1, Issue 1, 2020, p. 37.

²⁰ Bassem Ahmed Amer, "Digital Currencies: Bitcoin as a Model" and Their Compatibility with Islamic Money Regulations," *op. cit.*, p. 274.

²¹ Ayman Ezz El-Din, "Digital Currencies and Their Relationship to E-Commerce (Case Study: The United Arab Emirates (Dubai))," Master's Thesis, Department of Accounting, College of Business Administration, Middle East University, June 2019, p. 2.

²² Dr. Dalia Ibrahim, *Cryptocurrencies: Between Opportunities and Risks*, Cabinet, Decision Support and Support Center, Egypt, September 2, 2021.

- *Bitcoin*: This virtual currency was created in 2011 and is based on the Bitcoin protocol. However, it was designed to make mining relatively cheap, easy, and faster to use. Its popularity has increased in recent years²³.

- *Peer coin*: Launched in 2012, it is considered more environmentally sustainable than other cryptocurrencies. It is designed with an inflation rate of 1% and is the third-largest cryptocurrency that can be mined after Bitcoin and Lite coin. Its security and processing processes differ significantly from those of the previous two currencies²⁴.

- *Dash*: Launched in 2014, this cryptocurrency offers many advantages over Bitcoin, being more private. Dash offers greater anonymity because it operates on a decentralized MasterCard network and enables transactions to be untraceable. By 2018, its market cap reached \$2019 billion, with a token value of \$266.58²⁵.

- *Ethereum*: Developers use it to pay each other for helping build applications, rather than competing with Bitcoin. Ethereum complements Bitcoin and is used to create platforms dedicated to crowdfunding²⁶.

- *Libra*: Facebook's Libra project, which will be used for payments made via social media applications (Facebook, WhatsApp, Instagram), such as transferring money between users or for buying and selling transactions conducted through these applications²⁷.

Researchers see from the above that there is a significant positive relationship between the spread of virtual currencies and the presence of electronic infrastructure. This was demonstrated by the previously explained requirement for their formation and mining to require an electronic infrastructure and advanced computers connected to the internet. Therefore, the second hypothesis is confirmed: there is a relationship between the spread and use of virtual currencies and the presence of electronic infrastructure.

3.5. Characteristics of Virtual Currencies

Virtual currencies share many characteristics with currencies and commodities. The availability of associated capabilities and technologies, both for investors and consumers, also presents a source of risk for both users, investors, and regulators. To explain the characteristics of virtual currencies, we will highlight their advantages and disadvantages, as well as their legal and official status and future. Accordingly, there are several advantages to virtual currencies, including following.

3.5.1. Advantages of Cryptocurrencies:

- *Global*: Virtual currencies are not tied to a specific location for trading, as they are not subject to the authority of the state or a central bank. Therefore, no country can prohibit trading in them because they are not subject to its authority or control. They can be traded as if they were your local currency²⁸.

²³ Khaled Mohamed Hamdy, Cryptocurrency Trading and its Threats to Community Security, Faculty of Islamic Propagation, Cairo, Al-Azhar University, Volume 2, Issue 33, 2021, p. 231.

²⁴ Abdullah Ahmed, The Reality of Bitcoin and the Ruling on Dealing with It (A Comparative Jurisprudential Study), op. cit., p. 2488.

²⁵ Dr. Suwailihi Nour El-Din, The Impact of Bitcoin and Virtual Currencies on the Stability of the Global Monetary System, op. cit., p. 225.

²⁶ Tahri Al-Siddiq, The Spread of Digital Currencies in Light of the Coronavirus Pandemic: Bitcoin as a Model, Dafater Buadix Journal, Algeria, Volume 10, Issue 202, p. 429, 2021.

²⁷ Central Bank of Jordan? Department of Supervision and Control of the National Payments System, Study entitled Cryptocurrencies 2020, p. 15.

²⁸ Herdo Center for Digital Expression Support, Alternative Transaction Platforms and Digital Currencies: Between Freedom of Transaction and Censorship Issues, Cairo 2020, p. 6.

- *Privacy and Secrecy*: Virtual currencies enjoy privacy, as no person, regulatory body, or institution can access their electronic wallets. Every transfer made between two people is recorded publicly in what is called the block chain. This record does not require the name, identity, or any personal data of the individual. All personal information consists of numbers and symbols whose owner's name and identity are unknown²⁹.

- *Encryption*: Virtual currencies rely on changing the form of the currency's private information into another form using mathematical equations, or encryption algorithms. Data is transformed from readable data to unreadable, encrypted data to prevent unauthorized persons from reading or transacting with it³⁰.

- *Low fees*: Transactions with virtual currencies involve no or very few fees, unlike traditional currencies, which do have fees for their use³¹.

- *High security*: The technology used for virtual currencies is the largest computing project with high-quality services. It offers a high degree of security against theft or counterfeiting, as its records are strongly encrypted and cannot be easily hacked³².

- *Decentralization*: Virtual digital currencies are characterized by the absence of a central financial authority that issues or oversees their circulation. They are issued by an anonymous entity. They are encrypted virtual currencies whose purpose is to allow users to send money to each other over the internet via a peer-to-peer network without the need for a central authority to monitor payment and transfer transactions, while maintaining their anonymity³³.

- *Transparency*: Virtual currencies operate with complete transparency and freedom, with currency transfers taking place between different wallets, and all users acknowledging the existence of these funds and the transfer of ownership³⁴.

Researchers see the aforementioned advantages as potentially disadvantages, especially considering that these advantages belong to a currency intended to become circulating money and a means of payment, gaining legal recognition and the trust of individuals, even governments and organizations.

How can this be achieved given encryption, the lack of guarantees from official bodies, and the decentralization of its issuance? As for transparency and the lack of knowledge of the owner's identity, this weakens the owner's position as the person to whom the virtual currency is transferred. He cannot resort to official bodies to claim his right to it or in the event of its loss. These are in addition to other disadvantages affecting the economy, which we explain below.

²⁹ Khaled Mohamed Hamdy, Cryptocurrency Trading and its Threats to Community Security, Annual of the Faculty of Islamic Propagation in Cairo, Al-Azhar University, Volume 2, Issue 33, 2020/2021, p. 232.

³⁰ Lafi Mohamed Daradkeh, Challenges of Keeping Legal Regulations in Accompany with Technological Developments in Financial and Banking: Bitcoin (Digital Currency) as a Model for Safe Use with Technological Guarantees in the Absence of Legal Guarantees, Kuwait International Law School Journal, Proceedings of the Fifth International Conference, 2018, p. 341.

³¹ Abdullah Ahmed, The Reality of Bitcoin and the Ruling on Dealing with It (A Comparative Jurisprudential Study), op. cit., p. 2491.

³² Khaled Mohamed Hamdy, Cryptocurrency Trading and its Danger to Community Security, Annals of the Faculty of Islamic Propagation in Cairo, Al-Azhar University, Volume 2, Issue 33, 2020/2021, p. 232.

³³ Dr. Suwaili Nour El-Din, The Impact of Bitcoin Mining and Virtual Currencies on the Stability of the Global Monetary System, op. cit., p. 221.

³⁴ Mohamed Abdel Fattah, Mohamed Ahmed El-Saeed, The Impact of Bitcoin's Electronic Trust Factors on Hotel Transactions as a Mechanism for Digital Transformation in Egypt, Journal of the Union of Arab Universities for Tourism and Hospitality, Faculty of Tourism and Hotels, Suez Canal University, Volume 20, Issue 4, 2021, p. 513.

3.5.2. Disadvantages of Virtual Currencies

Virtual currencies have become a means of payment for some people. They can now be exchanged or purchased for dollars or euros between individuals, organizations, and companies. No one interferes in determining their price; rather, it is determined based on supply and demand. However, there are disadvantages to their use, such as forgetting the password for the program, which can result in losing your money forever. This is in addition to the many drawbacks associated with virtual currencies, which reduce their use and adoption as official currency, including:

- *Their threat to national security and the financing of terrorism:* Countries must be aware of the risks of using virtual currencies. According to the Financial Action Task Force (FATF) report of the G20 Finance Ministers and Central Bank Governors in July 2018, the increasing use of virtual currency activities has been driven by several factors, including money laundering, terrorist financing, drug trafficking, and fraud. Terrorist and extremist groups seek to provide stable financial resources that are difficult to track and confiscate by banks and financial institutions, or by public authorities in countries and governments. Therefore, they actively seek to exploit modern technologies and mechanisms to conceal their financial resources and encrypt their transfers, making it difficult to track these financial transactions and identify their parties and the entities transacting with them³⁵.

- *Tax Evasion:* Virtual currencies can be an innovative and hidden form of tax evasion, as they operate without a legal system and are held in cyberspace accounts known as online wallets. The size of the formal, informal economy increases due to the lack of registration of these financial activities, leading to an increase in the size of the informal market. The lack of oversight by any central or official authority over the exchange of goods and services, and the state's inability to impose taxes on these transactions, leads to increased tax evasion, which impacts the state's fiscal policy³⁶.

- *Currency Price:* The price of virtual currency is determined by supply and demand, which leads to significant fluctuations and problems for its users and the economy, such as speculation, inflation, capital flight, weak investment, and other economic and financial damage³⁷.

- *Mining:* One of the most significant drawbacks and shortcomings of virtual currency, and a stumbling block to its global spread, is the difficulty of mining to issue it. Mining involves solving puzzles and difficult mathematical equations, which not everyone can perform. It requires someone with computer skills. Therefore, mining is often carried out by companies specializing in the purchase of advanced mining equipment³⁸.

- *Lack of legal protection:* When using virtual currencies and an error occurs in the execution of transactions resulting from these virtual currencies, such as paying another beneficiary, transferring an incorrect amount, or not completing the transaction in a timely manner due to an error in the currency wallet platform or other technical reasons, in most virtual currency systems, the erroneous transaction cannot be reversed, and the user has no recourse against the other parties³⁹.

³⁵ Asim Adel Muhammad, Virtual Digital Currencies as a Way to Financing Terrorism, Al-Zaytoonah University Journal of Legal Studies, Al-Zaytoonah University, Jordan, Volume (1), Issue (1), 2020, pp.

³⁶ Maurício Portieri Pignatti, Carlos Manuel Baptista Lobo, The Digital Currency and The Challenges Beyond The New Global World 'S Blockchain Paradigm A Financial and Tax Overview on The Virtual Currency Efficiency, op.cit,p49.

³⁷ Dr. Abdel Halim Mahmoud, A Preliminary Economic Assessment of Bitcoin Risks (November 2021), p. 52.

³⁸ Abdullah Ahmed Muhammad, The Reality of Bitcoin and the Ruling on Dealing with It (A Comparative Jurisprudential Study), op. cit., p. 2493.

³⁹ Abdullah Ahmed Muhammad, The Reality of Bitcoin and the Ruling on Dealing with It (A Comparative Jurisprudential Study), op. cit., p. 2493.

- *Money laundering*: The crime of money laundering is defined as the process of recycling illicit funds and concealing, covering up, and disguising the true illicit source of these funds. Modern information and communication technology has facilitated banking to the point where it is now possible to transfer huge sums of money in a short period of time from one country to another. This facilitation provided by modern information and communication technology has had a negative impact, as it has created dangerous methods and means that have been exploited to commit money laundering crimes. International attention is focused on combating this crime, as it serves as a benchmark for ensuring that a state and its financial institutions comply with international requirements. This has prompted countries to enact laws, regulations, and specialized institutions to combat this crime. Combating this crime may result in placing them on a blacklist of countries with high risk for financial transactions. This could result in penalties and restrictions on financial transactions, such as remittances, if a country fails to comply with these laws⁴⁰.

- *Multiple technical risks*: The issuance of virtual currencies relies on advanced technology that may not keep pace with rapid developments in information technology. The system may be poorly designed or defective, or the poor performance of the communication networks or devices necessary for operation may hinder the completion of the exchange or extraction process⁴¹.

- *Drug and illicit goods trafficking*: Virtual currencies are described as encrypted currencies with anonymity, through which neither the seller nor the buyer can be reached, making them a great medium for sellers of illicit goods such as drugs⁴².

Given the above and these shortcomings, some are wondering whether, given these significant risks, virtual currencies could be the nucleus and pretext for creating a global administration to impose a unified virtual currency on the world's countries, similar to what happened at the Bretton Woods Conference. Or, are some countries willing to adopt this strategy as a means of disbursing debts they incurred from the rest of the world? That is, virtual currencies are exchanged for high dollar prices and then devalued.

4. THE IMPACT OF VIRTUAL CURRENCIES ON BANKING TRANSACTIONS AND THE ECONOMY

Maintaining the value of a currency is one of the most important functions and responsibilities of a central bank, protecting its rights and obligations and the effects of a currency's rise or fall⁴³. The emergence of virtual currencies represents an expansion of the role of central banks by providing an alternative to the records held by central banks, which record transactions between different financial institutions. This ensures that funds are not transferred from one account to another twice, i.e., double-exchange transactions, bypassing the role of banks in issuing currency, and other matters.

⁴⁰ Tahiri Al-Siddiq, The Spread of Digital Currencies in Light of the Coronavirus Pandemic: Bitcoin as a Model, *Dafatir Buadix Journal*, Algeria, Volume 10, Issue 1, 2021, p. 438.

⁴¹ Khaled Muhammad Hamdi, Cryptocurrency Trading and Its Danger to Community Security, *op. cit.*, p. 247.

⁴² Mohamed Abdel Fattah, Mohamed Ahmed El-Saeed, "The Impact of Bitcoin's Electronic Trust Factors on Hotel Transactions as a Mechanism for Digital Transformation in Egypt," *Journal of the Association of Arab Universities for Tourism and Hospitality*, Faculty of Tourism and Hotels, Suez Canal University, Volume 20, Issue 4, 2021, pp. 1-2.

⁴³ Dr. Zekry Abdel Razek, "The Legal System of Electronic Banks," *Contemporary Egypt Journal*, Egyptian Society of Political Economy, Statistics, and Legislation, Issue 499, July 2020, pp. 480-484.

4.1. The Impact of Virtual Currencies on the Swift Real-Time Financial Telecommunications System

The SWIFT financial system is a system used in the world of financial transactions, operating on financial communications between banks around the world. It is an organization founded in 1973 in Brussels to establish certain common processes and standards for financial transactions. Banks around the world needed a way to transfer money from one country to another, and the SWIFT financial system provides a network that allows more than 10,000 financial institutions in 212 different countries to send and receive information about financial transactions to each other⁴⁴. Banks play a key role in cross-border payments using the SWIFT global interbank financial communications network. However, with the rise of modern financial technologies and the proliferation of electronic payment companies such as (Amazon, Alibaba, PayPal, and other emerging companies), banks have lost a significant share of the payment business in global financial markets. These companies have even outperformed banks in financial markets in terms of speed, cost, and transparency of cross-border payment services. To address these challenges, global and local banks are testing the potential application of block chain technology to regain their role in this field and address the shortcomings of the SWIFT system by increasing the speed of cross-border financial transactions compared to the current SWIFT system, which takes several days to process a cross-border payment, in addition to the SWIFT costs of approximately \$50 per payment. It can be argued that, globally, policymakers should prioritize accelerating cross-border payments and making them less costly, more transparent, and more inclusive, based on the G20 Roadmap for Cross-Border Payments. Time is of the essence, and action must be decisive, swift, and well-coordinated globally so that benefits flow smoothly. However, the use of cryptocurrencies has led to the efficiency of global payments, reduced the speed and cost of transactions, and the elimination of financial intermediaries. These currencies are international in nature, unrestricted by geographical or temporal boundaries. They can be transferred at any time to and from anywhere in the world with complete privacy, without going through any regulatory body, and without incurring fees or exchange rate differences between different currencies⁴⁵. Researchers believe that the emergence of cryptocurrencies directly impacts the money transfer system, or SWIFT, causing banks to lose a significant portion of their capabilities, resources, and role. Given this speed and the lack of fees, individuals and companies prefer to resort to cryptocurrencies. Therefore, countries must act quickly to preserve the SWIFT system by regulating and studying the timing of money transfers, reducing transfer fees, or using block chain technology, upon which cryptocurrencies are based, to benefit from its advantages and avoid its drawbacks.

4.2. The Impact of Virtual Currencies on Financial and Economic Stability

Financial stability in any country is a prerequisite for ensuring its economic and political stability. There are many aspects to the impact of these virtual currencies on financial and economic stability in countries, including:

- *Capital flight*: Money launderers who possess vast amounts of illicit funds and establish economic projects with the intent of laundering them will not hesitate to liquidate these projects once they achieve their goal⁴⁶.

⁴⁴ International Monetary Fund, "The Rise of Cryptoassets Imposes New Challenges to Financial Stability," October 2021.

⁴⁵ Dr. Dalia Ibrahim, "Cryptocurrencies: Between Opportunities and Risks," Cabinet Decision Support Center, Egypt, September 2, 2021.

⁴⁶ Bassam Ahmed Al-Zalmi, The Role of Electronic Money in Money Laundering, Damascus University Journal of Economic and Legal Sciences, Faculty of Law, Damascus University, Volume 26, Issue 1, 2020, p. 5.

Therefore, we find that some link the issuance and supply of money to the strength of a country's economy and the increase in national income, as the strength of a country's economy is measured by its possession of money or items that represent money. We also find that banks that are reluctant to allow money laundering operations to take place through them resort to limiting banking secrecy to monitor and combat these operations, thus losing many of their customers. No one would accept dealing with a bank that does not adhere to banking secrecy or frequently violates it, which ultimately negatively impacts the bank's business⁴⁷.

- *Balance of Payments Deficit*: Virtual currencies cause tax evasion, increased public spending to combat the crimes they cause, and their impact on investment and increased demand for consumer goods, especially luxury goods. Imports increase at the expense of exports, thus creating a balance of payments deficit⁴⁸.

- *Monetary Policy*: Central banks are affected by the decline in seigniorage (the profits accruing from the right to issue currency), which in turn reduces one of the central banks' most important sources of income. Therefore, countries must establish appropriate regulatory rules to reflect the level of risk arising from the use of virtual currencies⁴⁹.

- *E-Commerce*: In the past, commercial transactions relied on face-to-face meetings for the purpose of buying and selling. This method continues to this day, but it has undergone fundamental and radical changes, making it possible to conduct buying and selling without face-to-face meetings. However, e-commerce has become associated with online shopping, through which large sums of money can be transferred from one account to another without any oversight. It is undeniable that e-commerce has many advantages that make it much easier for consumers than traditional shopping. However, with the use of virtual currencies, we find that it may become very widely accepted for fraudulent operations⁵⁰.

Researchers believe, based on the above, that virtual currencies have numerous impacts and repercussions on the economy and financial stability of countries. These include their impact on capital flight due to perceived risk, or the occurrence of a deficit in the balance of payments due to increased imports, which impacts economic performance. They also result in a shortage of cash in banks as a result of exchanging it for highly risky and speculative virtual currencies. This is in addition to the loss of many of the powers and functions of banks in maintaining monetary stability and controlling the market from inflation, among other issues.

5. CONCLUSION

The study examines cryptocurrencies and their impact on the future of transactions (present and future prospects). This is accomplished by defining cryptocurrencies, their similarity to traditional and digital currencies, and the challenges facing their use and future in the world.

The study concludes with several findings, the most important of which are:

- The level of acceptance of cryptocurrencies in payments among individuals is low, as they are limited to a specific group of computer users and professionals.
- They cannot be relied upon as a unit of measurement due to their price fluctuations.
- Virtual currencies lack the necessary infrastructure and regulations to support them as monetary currency in many countries and entities.
- Virtual currencies have no legal force but derive their power from the voluntary agreement of the parties. They are not subject to the control or regulation of a government or central bank.
- The issuance of virtual currencies depends on mining, which is a complex electronic process.

⁴⁷ Central Bank of Jordan, Study entitled "Cryptocurrencies," op. cit., p. 15.

⁴⁸ Bassam Ahmed Al-Zalmi, The Role of Electronic Money in Money Laundering, op. cit., p. 555.

⁴⁹ World Bank Blogs, Can Cryptocurrencies and Blockchain Help Fight Corruption?, 11/11/2021.

⁵⁰ Dr. Ehab Khalifa, "Is it possible to convert national currencies into cryptocurrencies?" (February 9, 2021) Al-Mustaqbal for Advanced Research and Studies.

- Virtual currencies rely on complex technologies based on the peer-to-peer principle over the internet, relying on both encryption technology and the highly sophisticated technology of block chain.
- The numerous risks of its use have significantly impacted its spread.
- The failure to meet the criteria for its validity, as previously stated, as a monetary currency (a medium of exchange, a standard of value, a store of value, and a means of deferred payments), which has impacted its spread.
- Its disorganized issuance environment and price fluctuations hinder its spread.
- The lack of security of cryptocurrencies and the digital platforms that rely on their integrity.
- Its impact on the banking system, the global SWIFT system, monetary policy, and capital flight, which impacts the global and national economy.
- Its impact on taxes, stock markets, and investment in all countries, causing significant economic damage.

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FINANCIAL DOMINANCE IN A MULTIPOLAR WORLD: IS THE DOLLAR LOSING ITS STATUS AS THE GLOBAL RESERVE CURRENCY?

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ABSTRACT

In the contemporary multipolar economic order, significant shifts in the global monetary system raise questions about the sustainability of the U.S. dollar as the dominant global reserve currency. The process of de-dollarization, driven by geopolitical tensions, sanctions, and the diversification of foreign exchange reserves, has led to the increased use of alternative currencies such as the euro, the Chinese yuan, and central bank digital currencies. This paper examines the key factors contributing to the erosion of dollar dominance, including the economic strategies of major economies, the strengthening of regional trade blocs, and the role of multilateral financial institutions in shaping new monetary arrangements. Additionally, it explores the implications of a potential transition toward a multipolar monetary system for global economic stability, considering both the benefits and risks of such restructuring. Through an analysis of recent trends and empirical data, this study aims to provide insights into whether the world is on the verge of a fundamental transformation in international finance or if the dollar will retain its central role in the foreseeable future.

Keywords: *Alternative currencies, De-dollarization, Financial stability, Global reserve currency, Multipolar world, U.S. dollar*

1. INTRODUCTION

The global economic landscape of the 21st century increasingly reveals a shift from a unipolar to a multipolar order, in which the traditional dominance of the West—particularly that of the United States—is being challenged by the rise of strong regional and global economic centers. In this transition, the financial dimension plays a crucial role, especially regarding the status of the U.S. dollar as the primary global reserve currency. For decades, the dollar has been the backbone of the international monetary system, a symbol of trust and stability. However, in recent years, a growing trend of dedollarization has emerged, raising important questions about the future of U.S. financial dominance (Eichengreen, 2011; Subacchi, 2020). This phenomenon is not driven solely by economic factors but is also significantly influenced by geopolitical tensions, unilateral sanctions, and shifts in the structure of international trade. In this context, an increasing number of countries—led by China, Russia, India, and many developing nations—are actively seeking alternative models of settlement for international transactions (Ocampo, 2017; IMF, 2023).

At the same time, other currencies such as the euro and the Chinese yuan are gaining prominence, along with experimental forms of money like central bank digital currencies (CBDCs). These developments indicate that the international monetary system is undergoing a transformation that could lead to the loss of the dollar's exclusive role (Klein & Pettis, 2022). This paper seeks to answer the research question: Is the U.S. dollar truly on the path to losing its status as the global reserve currency in a multipolar world? Accordingly, the aim of this study is to analyze current trends in the global financial system, examine the causes and consequences of the dedollarization process, and explore the opportunities and challenges associated with the transition to a multipolar monetary architecture. By analyzing the historical, economic, and political dimensions of dollar dominance, as well as the role of alternative currencies and international financial institutions, this paper aims to offer a comprehensive view of the current state and potential directions of the global monetary system. Particular attention will be paid to the effects that this transition may have on international financial stability, the sovereignty of developing countries, and the long-term trajectories of the global economy. This is more than a technical issue of monetary policy—it represents a redefinition of the very nature of global power in the 21st century.

2. GEOPOLITICAL CONTEXT AND THE DEVELOPMENT OF MULTIPOLARITY

Over the past decade, the global political and economic order has undergone significant transformation. While the United States held the position of the dominant global power for much of the 20th century, the world today is on the threshold of a transition from a unipolar to a multipolar order. This shift entails a reduction in the dominance of a single country in favor of multiple centers of power, with the process of multipolarity emerging as a key factor shaping the future of international relations, including the global financial system (Eichengreen, 2011; Subacchi, 2020). The erosion of the unipolar order does not necessarily signify the total weakening of one country, but rather a complex dynamic in which other global actors are gaining strength and seeking greater influence and control over international finance and policy. This has been driven by geopolitical changes, new economic models, as well as shifts in military and technological domains (Klein & Pettis, 2022). As a result, countries such as China, Russia, India, and others are becoming central players on the global economic stage, diminishing the recognizable dominance of the United States.

2.1. The Erosion of the Unipolar Order: Declining U.S. Influence in Relation to Other Global Powers

For decades, the United States was the sole superpower dominating global politics and economics. However, following the Cold War and the end of bipolar division, U.S. dominance began to face increasing challenges. Many of these challenges stem from the rise of new economic and political power centers, particularly China, Russia, and countries of the Global South (Ocampo, 2017). China, with its tremendous economic growth, has become a key player in redefining the international balance of power. Its ability to influence global financial markets, its impact on international trade arrangements, and its involvement in developing new payment systems pose a serious challenge to the dollar's status as the global reserve currency (Subacchi, 2020). Similarly, despite economic sanctions and global isolation, Russia has leveraged its position in global energy markets to shape new economic and financial alliances, often in direct opposition to Western interests (Hudson, 2003). Moreover, trends in multilateral trade arrangements and the strengthening of regional integration, such as BRICS (Brazil, Russia, India, China, and South Africa), further diminish the central role of the United States in shaping global financial policies.

In addition to economic and political factors, social, environmental, and technological developments also play a significant role in forming a new approach to international relations, one that no longer relies on Western hegemony (Eichengreen, 2011; IMF, 2023).

2.2. The Role of China and Russia: Key Drivers of Multipolarity

China is undoubtedly the most prominent actor in the process of global multipolarization. With its growing trade and political influence, especially in Africa and Latin America, China is actively expanding its role in global economic affairs, making significant strides in reducing dependence on Western financial institutions (Eichengreen, 2011). Initiatives such as the Belt and Road Initiative and the development of alternative payment systems—such as the Cross-Border Interbank Payment System (CIPS)—allow China to offer an alternative to the SWIFT network and position itself as a monetary competitor (Klein & Pettis, 2022). Russia, though a smaller economy compared to China, also plays a key role in this process. Through energy diplomacy, particularly via the export of natural resources such as oil and gas, Russia influences the global economy and steers other countries toward new financial arrangements. Through strategic agreements with numerous countries, Russia is strengthening ties with alternative markets, especially in Asia, thereby reducing its reliance on the dollar (Subacchi, 2020). Together with other actors like India—which is also becoming increasingly active in global financial markets—China and Russia are laying the groundwork for new geopolitical alliances that may alter the dynamics of international finance. Additionally, countries such as Iran, Turkey, and various developing nations are making efforts to diversify their foreign exchange reserves and seek alternatives to the dollar, thereby exerting growing influence on the global monetary system (Hudson, 2003; IMF, 2023). Given these changes, the question arises: how will the international community adapt to a new economic environment characterized by a reduced U.S. role and the rising influence of other global players? This shift may lead to a rebalancing of power and the emergence of a new global economic system.

3. THE POSITION OF THE U.S. DOLLAR IN THE MODERN FINANCIAL SYSTEM

For decades, the U.S. dollar has held a central position in the global financial system, functioning as the primary reserve currency, a medium of international exchange, and the dominant unit of account in trade and finance. This position is not solely the result of the economic strength of the United States, but also of an institutional, political, and geostrategic framework carefully constructed after World War II. Although the dollar still enjoys the status of the world's most important currency, growing challenges on the international stage—including the rise of multipolarity, de-dollarization initiatives, and the ascent of competing currencies—raise questions about the sustainability of its dominance in the future (Eichengreen, 2011; Subacchi, 2020).

3.1. The Historical Rise of the Dollar

The rise of the dollar as the global reserve currency began at the end of World War II, when a new international monetary order was established at the Bretton Woods Conference in 1944. Under this system, the U.S. dollar became the only currency directly convertible into gold, while all other currencies were pegged to the dollar. This structure enabled the United States to become the backbone of the global financial system, using its economic and industrial superiority to support its monetary hegemony (Eichengreen, 2011). After the collapse of the Bretton Woods system in 1971 and the end of the gold standard (the so-called Nixon Shock), the dollar maintained its dominant status through the establishment of the petrodollar system. Oil and other strategic commodities continued to be sold exclusively in dollars, which artificially created sustained global demand for the U.S. currency (Hudson, 2003).

This transformation enabled the U.S. to finance deficits with lower interest rates and without fear of devaluation, thanks to the privilege of printing a currency that was widely accepted and in demand (Ocampo, 2017). Furthermore, the dominance of the dollar was supported by the political stability of the United States, its developed and deep financial markets, and the global influence of international financial institutions such as the International Monetary Fund (IMF) and the World Bank, both of which were significantly influenced by U.S. policy (Subacchi, 2020).

3.2. Advantages and Challenges of the Dollar Today

The dollar still enjoys a number of structural advantages that maintain its dominance in global transactions. First and foremost, U.S. financial markets remain the deepest and most liquid in the world, providing investors with high security and efficient capital allocation. Confidence in the stability of the U.S. political and legal system, as well as the status of the U.S. as the world's most powerful military force, further reinforces the dollar's position (IMF, 2023). More than 58% of global foreign exchange reserves are still held in dollars, while approximately 40% of international debt is denominated in this currency (BIS, 2023). Below is a comparative table of the three key currencies in the modern system:

Currency	Share in Global Reserves (%)	Share in Global SWIFT Transactions (%)	Share in Global Trade (%)	Liquidity and Acceptance	Political Risk	Impact of Sanctions/U.S. Policy
U.S. Dollar (USD)	58.4	42.0	38.0	Very high	Low	High
Euro (EUR)	20.6	31.0	34.0	High	Low	Medium
Chinese Yuan (CNY)	2.8	3.5	15.0	Medium	High	Low

*Table 1: Comparison of Currencies in the Modern Financial System
(Source: International Monetary Fund (IMF), Currency Composition of Official Foreign Exchange Reserves (COFER), Q4 2023.)*

However, modern challenges increasingly threaten the privileged position of the dollar. First, a growing number of countries are seeking alternative models to reduce their dependence on the dollar – a process known as dedollarization. Geopolitical conflicts, such as sanctions imposed by the U.S. on other countries (e.g., Iran, Russia), motivate many nations to develop their own payment systems or rely on bilateral transactions in national currencies (Klein & Pettis, 2022). Second, the rise of digital currencies – both decentralized (cryptocurrencies) and centralized, like central bank digital currencies (CBDCs) – represents a potentially disruptive factor to the dollar's dominance. China, for example, has made significant progress in implementing the digital yuan, which could reduce the use of the dollar in trade within the Asian region (Subacchi, 2020; IMF, 2023). Third, economic factors such as the growth of U.S. public debt and budget deficits also raise doubts about the long-term sustainability of trust in the dollar. The combination of fiscal expansion and increasing political divisions within the U.S. may reduce the dollar's attractiveness as a global safe haven (Eichengreen, 2011).

The impact of dedollarization is particularly felt in developing countries. Those that were previously highly dependent on the dollar are now searching for alternatives to increase their monetary autonomy. The following table presents an example of the impact of dedollarization on selected countries:

Region/Country	Dependence on USD (%)	Active Dedollarization Measures	Impact on Currency Stability	Increased Use of Alternative Currencies
Latin America	70	Limited	Medium	EUR, CNY
Southeast Asia	65	Moderate	Low	CNY
Sub-Saharan Africa	60	Low	High	CFA, CNY
Russia	40	High	Moderate	CNY, RUB
Iran	35	Very High	Low	CNY, AED
Argentina	80	Moderate	Very High	CNY, BTC

Table 2: Impact of Dedollarization on Developing Countries

(Sources: Bank for International Settlements (BIS), Quarterly Review, 2023. and UNCTAD, World Investment Report, 2023.)

Despite the aforementioned challenges, these data show that the dollar still holds a strong position due to deeply rooted global structures. However, the speed and intensity of transformations in the international system necessitate careful observation of the possible gradual shift toward a more multipolar monetary reality.

4. ALTERNATIVE CURRENCIES AND DEDOLLARIZATION TRENDS

In the context of rising multipolarity and geopolitical tensions, an increasing number of countries and financial institutions are rethinking their dependence on the US dollar. The process of dedollarization, which was once slow and marginal, is now becoming systemic, with growing interest in alternative currencies and innovative models in international finance. This trend is further accelerated by the development of technologies such as central bank digital currencies (CBDCs), as well as the growing influence of China on the global economy. Below, we analyze two key dimensions of the contemporary dedollarization process: the rise of the Chinese yuan and the role of digital currencies.

4.1. The Rise of the Chinese Yuan

The Chinese yuan (renminbi – RMB) has seen a significant increase in international use in recent years, both in trade transactions and in the foreign exchange reserves of individual countries. This trend is part of a broader Chinese strategy for the internationalization of its currency, driven by the growth of the Chinese economy, initiatives like the "Belt and Road Initiative," and the strengthening of bilateral trade arrangements in yuan (Zhou, 2021). According to data from the Bank for International Settlements (BIS), in 2023, the RMB was the fifth most used currency in international payments, with around 3.5% of the share in SWIFT transactions. The accelerated adoption of the RMB is also supported by swap agreements the People's Bank of China has made with the central banks of other countries, allowing direct currency exchanges without the mediation of the dollar (Chen & Cheung, 2020). However, despite this progress, the RMB still lags behind the dollar and the euro in terms of liquidity, transparency, and investor confidence. Chinese capital markets are less developed and subject to state control, limiting the attractiveness of the RMB as a reserve currency.

Nonetheless, its advantages in bilateral trade agreements, particularly with developing countries and within the BRICS framework, give it a strategic advantage in the long-term process of dedollarization (Prasad, 2021).

4.2. Digital Currencies and New Models

The emergence of digital currencies brings a new dynamic to the global monetary system. Cryptocurrencies like Bitcoin (BTC) and Ethereum (ETH) represent alternative forms of money, independent of traditional financial institutions. Although cryptocurrencies are still not stable or widespread enough to replace the dollar in global finance, their underlying technology (blockchain) has laid the groundwork for a new form of monetary innovation – central bank digital currencies (CBDCs). CBDCs are digital versions of national currencies issued by central banks, enabling direct control over payment systems and monetary policy. China is a leader in this field, testing the digital yuan (e-CNY) on large geographic and demographic samples. The introduction of CBDCs allows for faster, cheaper, and more secure transactions, as well as greater resilience to US sanctions and the dominance of the dollar in international payment systems (Auer, Frost & Houben, 2022). The European Central Bank, as well as the US Federal Reserve (FED), are exploring the possibilities of introducing their own digital currencies. However, while China has already implemented functional pilot projects, the West still approaches this process with more caution due to concerns over privacy, regulatory challenges, and potential impacts on commercial banks. Digital currencies, both public (CBDCs) and decentralized (cryptocurrencies), are becoming an important factor in the future of the international financial system. Their development could erode the role of the dollar in the long term, especially if they are linked to trends in regional trade and growing distrust of American monetary hegemony.

5. CONCLUSION

Changes in the contemporary geopolitical and geo-economic structure have led to a reassessment of the existing system of financial dominance, centered around the US dollar. Although the dollar still holds a leading position in global foreign exchange reserves, international trade transactions, and financial markets, signs of its relative erosion are becoming increasingly evident. The multipolarization of the global order, the rise of economic powers like China, and the growing use of alternative currencies and mechanisms to bypass dollar flows all point to a gradual shift from a unipolar to a multipolar financial system (Eichengreen, 2011; BIS, 2023). The efforts of countries from the Global South to reduce their dependence on the dollar are further strengthened through initiatives such as bilateral agreements for trade in local currencies, dedollarization of foreign exchange reserves, and the development of new payment systems like CIPS (China Interbank Payment System) and SPFS (Russian Financial Messaging System). These changes are promoting the fragmentation of the international financial system and leading to a reduction in the privileged position of the United States, known as the "external existential rent" (Triffin dilemma). The Chinese yuan, although still far behind the dollar in terms of volume and trust, is gaining importance thanks to a combination of state policy, technological development (e.g., the digital yuan), and strategic alliances through initiatives like "Belt and Road." However, structural limitations—such as capital controls, limited convertibility, and institutional opacity—still present barriers to its full internationalization (Subacchi, 2016). Digital technologies, particularly the development of central bank digital currencies (CBDCs), add another layer of complexity to the existing system. Projects like mBridge (which brings together central banks from China, Hong Kong, Thailand, and the UAE) demonstrate the technical potential for cross-border payments outside the SWIFT network and without the use of the dollar (BIS Innovation Hub, 2023).

If such systems are institutionalized and expanded, they could significantly accelerate the multipolarization of the financial architecture. Finally, although the dollar retains its dominant position for now, the process of its relative erosion is ongoing. It will not necessarily be replaced by a single dominant alternative; rather, the world is likely to enter an era of competitive currencies, in which the dollar's dominance coexists with a greater role for the yuan, the euro, and regional currencies. Such a scenario calls for a more flexible institutional framework and a redefinition of the rules of international financial relations, in line with the changed global balance of power.

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THE IMPACT OF THE 1989 WASHINGTON CONSENSUS ON THE PROCESS OF DEREGULATION OF THE STATE AND LAW

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ABSTRACT

The Washington Consensus of 1989 is a series of economic recommendations aimed at market liberalization, fiscal discipline, and deregulation, which strongly shaped the transition policies of post-socialist countries. The paper analyzes the impact of the Washington Consensus on the processes of deregulation, privatization, and changes in the role of the state and law, especially in the period after 2000. By analyzing specific examples, such as mass privatization, labor flexibilization, reduction of social benefits, and strengthening the influence of international financial institutions, the consequences that these measures, the legal system, and the development of Serbia have had on social justice. The paper critically examines the results of the implemented policies and suggests directions for future socio-economic consolidation.

Keywords: *Washington Consensus, 1989, deregulation, state, law*

1. INTRODUCTION

The Washington Consensus is a term coined in 1989 by economist John Williamson, encompassing ten economic recommendations intended primarily for Latin American countries, but later applied in other transition economies, especially post-socialist countries, including Serbia. These policies promoted market liberalization, privatization, and deregulation. In Serbia, the implementation of these policies intensified after the political changes of 2000, under the influence of advice and conditional support from the IMF, the World Bank, and other Western institutions. The paper analyzes how the principles of the Washington Consensus have been applied in Serbia, their consequences for the economic system, social structure, and legal framework of the state. Special emphasis is placed on five key areas: privatization, labor flexibilization, reduction of social benefits, international influence, and legal deregulation.

2. PRIVATIZATION AND CONSEQUENCES FOR THE ECONOMIC STRUCTURE

Privatization was one of the main pillars of the Washington Consensus. In Serbia, more than 3,000 state-owned enterprises were privatized during the 2000s. Although the goal was to make the economy more efficient, the result was the closure of many factories, corruption in procedures, and mass unemployment. One example is the privatization of “Zastava” in Kragujevac, which after several unsuccessful attempts became part of the FIAT group. The process led to layoffs and changes in the role of unions, while long-term industrial development was not achieved. According to the World Bank (2015), around 200,000 jobs were lost between 2001 and 2010.

3. FLEXIBILIZATION OF WORK AND DEGRADATION OF LABOR RIGHTS

In line with the demands of the IMF and the World Bank, Serbia has liberalized its labor market. The new Labor Law of 2005 made it easier to fire workers, limited the power of unions, and reduced employee protection. Workers became increasingly precarious, often employed on a fixed-term basis, without stable legal and social protection.

According to the International Labor Organization (ILO, 2014), more than 30% of employees in Serbia were in precarious forms of employment. Klein (2007) points out that neoliberal reforms often imposed in times of crisis, so-called shock therapy, have had harmful consequences that would not have been politically possible under normal circumstances. Similarly, Rodick (2011) points out that there is an obvious conflict between globalization and democratic governance, as market rules often limit the room for maneuver of national governments.

4. REDUCTION OF SOCIAL BENEFITS AND CONSEQUENCES FOR POVERTY

The Washington Consensus implied a reduction in public spending, including social services. In Serbia, this led to pension cuts, health and education reforms, and the elimination of subsidies. The 2003 Pension Law increased the retirement age and reduced pension amounts. According to the World Bank (2014), more than 24% of Serbia's population lived below the poverty line. Public funding for health and education declined, increasing inequality and dependence on private services.

5. INFLUENCE OF INTERNATIONAL FINANCIAL INSTITUTIONS

The IMF and the World Bank have played a key role in shaping Serbia's economic policy through loans and advisory reports. Their demands included public sector reform, deficit reduction, and continued privatization. For example, under the 2009 IMF precautionary arrangement, financial assistance was conditional on public sector wage cuts and restructuring of state-owned enterprises. These policies were often implemented without sufficient adaptation to Serbia's social context, starting in 2000.

6. DEREGULATION AND CONSEQUENCES FOR THE LEGAL SYSTEM AND CITIZEN PROTECTION

Deregulation in Serbia has meant reduced inspection oversight, price liberalization, and weakening environmental and labor standards. Although the goal was to attract investment, the result has been corruption, monopolies, and a deterioration in the quality of services. Reduced state oversight has created space for abuses in privatization, illegal exploitation of resources, and non-transparent decision-making that favors private interests at the expense of the public good.

7. THE IMPACT OF THE WASHINGTON CONSENSUS OF 1989 ON THE DEVELOPMENT OF WESTERN CAPITALIST COUNTRIES FROM A CONTEMPORARY PERSPECTIVE

The Washington Consensus, as a set of economic recommendations originally intended for Latin American countries in crisis, as well as former socialist countries after the collapse of the socialist social order, has had a far-reaching impact on global economic policy and social trends in the designated countries through its 10 rules (guidelines, principles). Although formally his policies were not intended for Western capitalist countries, the consensus influenced the creation of a broader neoliberal orientation that many Western capitalist states began to implement during the last two decades of the 20th century. This influence was reflected, among other things, in the following aspects:

- 1) The consolidation of neoliberal ideology, as the consensus supported free markets, deregulation, privatization of state assets, and a reduction in the role of the state in the economy, which was the direction followed primarily by the Anglo-Saxon Western countries of the United States (President Ronald Reagan) and Great Britain (Prime Minister Margaret Thatcher).

The consensus strengthened the influence and legitimacy of such states and policies around the world. Stiglitz (2002) was among the first economic theorists to explain the role of neoliberal ideology.

- 2) The spread of privatization and deregulation in Western countries. Although these states were capitalist, many further privatized public services and reduced control over markets through deregulation. The banking and financial sectors were particularly liberalized, which later contributed to the financial crisis (2008);
- 3) Global harmonization of market policies. Western countries, through organizations of particular importance, such as the International Monetary Fund, the World Bank, and the World Trade Organization, have forced economic policies in line with the stated Consensus. In doing so, they have also acted according to the rules they have imposed on others;
- 4) Social consequences and increasing inequality. The implementation of the indicated principles of the Consensus has caused, among other things, a series of social consequences and a weakening of the welfare state, which has led to an increase in social inequality, precarious work and social tensions in many Western countries;
- 5) Long-term consequences in many Western countries even today, which has led to certain types of crises, political and social stratification, and the strengthening of populist and anti-globalization movements. There are demands for a stronger state role in the economy, for the reform of capitalism in terms of an inclusive and sustainable system.

The United States was the main promoter of neoliberal policies from the Washington Consensus, but at the same time they implemented them to a certain extent within their economy, primarily in the financial sector, during the two decades of the last century. They reduced taxes for the rich and corporations. They privatized public functions in the sphere of the prison system, education through schools, etc. They reduced social spending, i.e. the reduction of the welfare state. All this, among other things, caused huge inequality in income and wealth, the loss of jobs with benefits, the growth of populism. The Biden administration promoted state investments in infrastructure, green energy, subsidies in production, etc. The European Union partially adopted the principles of the Washington Consensus, particularly through the Maastricht Treaty and the introduction of the euro, which implied fiscal discipline and restrictions on public spending. The EU is also introducing market liberalization (especially in the energy, telecommunications and financial sectors), as well as austerity policies. The consequences in the European Union relate to long-term stagnation (Greece, Italy, Spain), growing dissatisfaction with EU policies, a shift in the political scene to the right, negative changes after the Covid-19 pandemic, which led to the creation of a common EU recovery fund, greater fiscal integration and state intervention. Strick (2014) points out that states, trying to meet the demands of the market and international institutions, become prisoners of debt and technocratic management, which has led to the erosion of democracy. Blyth (2013) indicates that austerity measures, especially in the specified EU countries, have had a counterproductive effect in the form of a decrease in domestic demand, an increase in unemployment, and political instability.

8. CONCLUSION

The Washington Consensus has left deep traces in the economic and social landscape of Serbia. Bukvić, R. M. (2012), among the first in Serbia, pointed out the essence and consequences of the Washington Consensus in Serbia and Southeast Europe, comparing these processes with the Morgenthau Plan for post-war Germany, emphasizing the need to abandon the neoliberal concept and adopt a strategy of reindustrialization, because the policy of privatization, deregulation and macroeconomic stabilization led to deep and long-lasting economic and social problems.

Neoliberal recommendations led to significant deregulation of the state and a significant loss of its social function, with an increase in poverty, unemployment and the collapse of public services. Although the reforms are aimed at modernization and accelerated transition, their negative effects indicate the need for a more balanced approach. The future development of Serbia requires a return to the concepts of social justice, regulation, and transparency of economic governance. The Washington Consensus and its neoliberal doctrines have deeply determined and shaped the economic policies and institutional frameworks of states in transition from the former socialist social order, other transitional states, but also the United States and the European Union, although these policies were initially promoted as instruments of modernization and growth. The United States, the main promoter of the principles of the Washington Consensus of 1989, as well as the European Union, have adopted the policies of the aforementioned Consensus. With an emphasis on market liberalization and a reduction in the role of the state. Therefore, today, among other things, it suffers certain consequences in the form of growing social inequality, political tension and the return of the idea that the state must play a more active role in the economy, primarily through green investments, subsidies and social programs. In recent years, especially after the tragic Covid pandemic and war and social conflicts in the world. Therefore, the idea of the necessity of a stronger state influence, greater social investment and sustainable economic development is increasingly present. In addition to the positive ones, numerous negative consequences have arisen in the state and society as a result of its implementation. The indicated state and activities of the USA and the EU, and not only them, in the economic and social sphere of social life necessarily necessitate a review of the previous implementation of the guidelines (principles) of the Washington Consensus, and the reduction and elimination of significantly harmful consequences in the socio-economic and political life of such states. We are in complex times full of global, geopolitical and other challenges that must be resolved in order to avoid disastrous consequences for the survival of the social community, peace in the world. The ruling elites, primarily in the large and powerful states of the world, have a huge responsibility to resolve such challenges and enable economic and social prosperity while preserving universal values.

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MEDIA SPACE IN THE REPUBLIC OF SERBIA AND ITS FUNCTION IN CREATING THE POLITICAL SYSTEM

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ABSTRACT

The media space in the Republic of Serbia is one of the key factors in shaping the political system, public opinion and democratic culture. This paper analyzes the structure of the media landscape, the degree of media freedom, as well as the relationship between the media and political actors. Special attention is paid to the role of the media in the formation of political narratives, the manipulation of information and the influence on the electoral behavior of citizens. Through the analysis of the legal framework, ownership structure of the media and information practices, it is investigated to what extent the media contribute to democratic development or, on the contrary, become an instrument of political control and polarization of society. The work indicates the need for greater media independence, professionalism and responsible journalism as prerequisites for building a functional and transparent political system. Media in modern societies functions as a bridge between government and citizens, shaping political opinion and behavior. In the Republic of Serbia, the media space has gone through significant transformations during the last decades, which affected its role in the political system. Although there have been attempts to liberalize the media market, numerous challenges continue to hinder the realization of complete media freedom and independence. The media in Serbia often function as an instrument of political propaganda, favoring certain political actors and marginalizing the opposition. This practice affects the formation of public opinion and the electoral behavior of citizens, thereby disrupting the democratic process. Although there is a legal framework that guarantees media freedom, in practice we face abuse of the media for political purposes. The media space in the Republic of Serbia plays a significant role in creating the political system, shaping public opinion and democracy. Although there are legal frameworks that guarantee media freedom, in practice we face challenges that hinder the realization of these rights. In this paper, we will pay special attention to the research of the influence of politics on the media, the importance of the media for the achievement of political goals, the essence and form of propaganda, political action in the environment of capitalist democracy.

Keywords: *Media, political system, Serbia, media freedom, democracy*

1. INTRODUCTION

The media that dominate around the Western Balkans, including Serbia, are precisely those with a national frequency, when we talk about television. Very often they are under the direct influence of political elites. The owners of these media are close to the ruling party, and the benefit is mutual. Such media are used for propaganda, degrading the opposition and shaping public opinion in favor of the government. This conception of the media structure devastates the basic democratic principles on which modern society should be organized, reduces political pluralism and limits or cancels freedom of expression.

The media in the Republic of Serbia often depend on state subsidies, and even more on the advertising space they rent, which creates clientelist relations between the ruling political elite and the media. It is this correlation that allows government representatives to influence the editorial policy of the media, favoring those who support the ruling political party and marginalizing critical voices, i.e. all those who think differently. Although positive legislation, including the Constitution of the Republic of Serbia, prohibits discrimination and guarantees media freedom, in practice there are still no effective protections that guarantee journalistic autonomy. These journalists are often persecuted or, on the other hand, are generally prevented from practicing their profession. The recent student protests in the Republic of Serbia, which began after the accident in Novi Sad, showed the importance and function of contemporary media in political engagement. One gets the impression that administratively that event caused the polarization of society, but also of the media in the Republic of Serbia. In support of this socio-political polarization is the fact that the pro-government media do not objectively and fully portray all social events, while on the other hand, the opposition media strive to mobilize as many dissatisfied citizens as possible in order to gain as large a critical mass as possible. This shows that the media in the Republic of Serbia exclusively function as an instrument of political power, as the so-called the "fourth branch of government", instead of the media being a channel for objectively informing citizens. Today's society does not know liberalism in all the forms in which it originated and existed. A liberal state is a consequence of the consent of free individuals, who thus establish the conditions for a permanent and peaceful coexistence. (Bajac, 2010:63) This status of the media seriously threatens democratic processes and freedom of expression, and it is of crucial importance to implement a reform aimed at creating greater transparency in work, stronger protection of journalists and more inclusive media pluralism.

2. CREATION OF MEDIA SPECTRUM ACCORDING TO THE CONCEPT OF NEOLIBERALISM

The media spectrum shares the fate of the world's economic and social trends and policies through the realization of generally accepted rules, patterns and pragmatism, and the unscrupulousness of the neoliberal concept. Mostly, the whole process boils down to the rejection and disrespect of legal norms - sovereignly realized thanks to the obvious and easily understood understanding that, instead of the general interest, it is adapted and implemented, now with a small percentage of exceptions, - in favor of the ruling elites, therefore, according to themselves and their own interests. In neoliberalism, there is the dominance of big capital, modern multinational companies, technocratic and political elites, the connection of global capital and the interests of the global elite, so media ownership is centralized in a small circle of owners, media freedom remains declarative, but through the development of the Internet and alternative media, it remains in practice at a certain level and breaks down national borders and obstacles (Miladinović-Bogavac, 2022:89). Before we analyze the media scene in Serbia and the influence of numerous factors in this paper, it is necessary, due to the comprehensiveness and knowledge of this topic, to start from global processes, by highlighting several important facts, tendencies and the complete picture in which the media industry is on the market, and in a constant fight in a merciless competitive game. The outcome is recognized and read as the mere survival and survival of the media corporations, with the complete putting and control of the governing structures into function, which causes tectonic disturbances. This is a general cross-section of the current situation in the media according to the already agreed position of the most famous media experts and analysts. Why did the media, instead of ambassadors of freedom of thought, encouragement of all common-sense potentials, creative possibilities, new knowledge, reach a "dead corner", drowning themselves in the general political-social mud they fell into?

What happened that from the "seventh force" media with incredible expansionism of possibilities on the technical and technological level lost the basic purpose and creed of this profession, and increasingly act as open sleuths in favoring political and social elites. In fact, they reached the position of the strongest stronghold of the rulers, their main link and defense, a constant driving force, all with the aim, without choosing the means, to increase their influence and power in the public. There are reasons for such a dramatic state of progress, but it, even as such, therefore, devastating and beyond all regulations, is increasingly being strengthened and defined in practice and theory as a new concept necessary to supposedly make societies better, more meaningful and desirable. New subterfuge, new lie! For whom and in the name of what? For autocrats, regimes that rest on the constant dogma that a lie repeated a hundred times can become the truth, on the manipulations of populist public opinion brought to the position that the less it thinks, the more it directs itself according to necessity towards the self-sustainment of bare existence and life. In recent decades, the media has been completely unprepared to confront the often-dirty capital, which is injected through the precise filtering of money laundering. They have entered their own twilight zone. Two prerequisites must be met for a democratic state to function at its full capacity: social and cultural, and these prerequisites are the factors that determine the place, role and importance of the state for modern society (Čupić, 2010: 200). Therefore, the financially weakened have reached the position of being bought by incompetent people, who have virtually no point of contact with media culture and the importance of this social segment. Due to other business interests, they cede the media space thus purchased to the "other hand", which without exception puts all available resources at the disposal of the leading political parties. If we objectively look at all the movements and directions of movement in media policies, we can determine without much risk that the global cross-section of the situation has reached the point of the common denominator for all countries on the planet. Almost without difference, and they are reduced only to certain local specificities, a sign of equality can be drawn between countries that have reshaped and changed the key purpose of presenting accurate information to the public, regardless of which interested party will be affected or released from responsibility. The present moment - starting from countries that constantly highlight the high level of democracy, freedom of opinion and truth as an axis that is constant, solid and unquestionable in social circumstances, all the way to countries with a much smaller democratic capacity.

3. THE MEDIA IN THE FUNCTION OF MAINTAINING THE RULING PARTIOCRACY

Political leaders and their media teams create a public scene in the information-communicative segment of society mainly with the motivation to reshape and change public opinion with different, very diverse techniques and methods of manipulation almost unheard of and unrecorded in recent media history. In terms of political organization, and in order to preserve control over the entire public opinion, the bureaucracy gladly declares itself in favor of a one-party system, which it presents as a new revolutionary quality (Atanacković, 1988:142). The defeat of such strategies, which are constantly taking place with undiminished tone, turned the media field into a polygon of one-mindedness, turning consumers into mere users of false content and leaders of pathological conditions that dissolve all social values, consciously and programmatically abandoning any kind of rationality, objective, timely and accurate information. The position of the media in a country is determined by the level of development of the political system of that country. The political system is the basis of the determination of the society and it is the landmark of social movement, and as much as the state creates the political system (we mean the people as the basic element of the state), the political system itself influences the definition of the contours of the state with ideological-institutional instruments (Ljubojević, Petrović, 2019:218),

The rhetorically proclaimed media freedoms and freedom of opinion are now read as ordinary phrases integrated into the defense of democratic principles, of which little remains, and sovereignty and respect for professional codes and ethical norms practically do not exist within their framework. All moral values have become optional, interpreted and presented exclusively through false arguments and a wide range of discriminatory terminology addressed to opponents. The problem has become so serious that it leads to open discrimination and persecution of media workers with different views in relation to the current political government. Therefore, it is not difficult to draw a conclusion and defend the stated thesis about the captivity and constant limitation of media freedoms, which can be marked almost daily as a sufficiently strong argument, supported by numerous examples, that the current media scene is under enormous pressure from political and economic oligarchies, for whom the truth in the public sphere is irrelevant and forever rejected. The monopolization of all resources by the leading social figures, who control the media space through highly complex and unclear ownership structures, enabled the privatization of the media space and its redistribution according to the needs of the rulers. Allowing them to dominate the public scene without the possibility that other social sectors, which do not agree with such proclamations, get even a minimal space to express different views or criticize the disastrous consequences of these strategies that are implemented and broadcast through the media. What is even more catastrophic and shocking is the constant intention to turn public broadcasters into propaganda tools, preventing the "citizen's right to know everything", completely changing the proclaimed slogan. Editorial policies are conducted from the centers of power, with editors and journalists practically turned into mere transmitters of the wishes and ambitions of political elites. And politics, as one of the human activities, if it does not have higher goals and if it is not based on values, is most often a source of great dangers for common life. (Čupić, 2002:82) Despite the clear legal regulations and the obligation to inform the public in a fair and truthful way - since these large and demanding media systems are mostly financed from the contributions of citizens - this should translate into an obligation to present all social phenomena and events of general interest without changing the truth or engaging in strict censorship that creates a false image of numerous events, phenomena and phenomena. This limits the space for creating democratic dialogue and undermines general prosperity due to inaccurate and false information. Their uncompromising ambitions to protect their own interests have culminated in the constant fragmentation of social groups, polarization and supremacy, the lack of other freedoms that are masked by the emphasis on the few free and professional media, despite the real situation that freedom of the media is, in fact, an imaginary category or a mere rhetorical tool used to reject the real state of the media scene. Practical tendencies, especially with the rise of party policies and authoritarian or even dictatorial regimes around the world, contribute to the articulation of single-mindedness, huge material differences, which led to the pacification of knowledge, intellectual capacities and the possibility for wider social strata to understand and develop critical awareness, recognizing the poisonous and dangerous methods of the center-right. Regardless of the harmful impact and far-reaching consequences that are reflected in all segments of society and its movements in general. One prominent example of direct retaliation comes from the "heart of democracy." Recently, the United States of America has experienced actions by President Donald Trump and his administration against established media organizations such as Voice of America, Radio Free Europe, and Radio Free Asia. Trump vetoed their continued operation, although the move was blocked by the Court of Appeals in Washington. His decision was declared unconstitutional. This is just one in a series of decisions that indicate an increasingly strong trend of controlling the entire media scene according to the personal whims and wishes of the US leaders. In the United States, media such as Fox News, CNN or MSNBC, although formally independent, often act as parallel structures of political parties, shaping narratives to suit their ideological or commercial interests.

This phenomenon leads to the polarization of the public and the collapse of trust in the media as an independent source of information. Serbia, as a society in a long-term transition process, is additionally burdened by the legacy of party control over public speech. From the nineties to today, the media sphere has gone through formal liberalization, but not essential emancipation. Instead of a state monopoly, we got an oligarchic-market one, in which a few tycoons and politically connected actors control the largest number of influential media. The situation in public services and print media is particularly alarming. The public service Radio Television of Serbia RTS, as a public broadcaster, increasingly functions as a spokesperson for the government, avoiding critical topics and marginalizing oppositional views. At the same time, tabloids close to the authorities conduct open discredit campaigns against journalists, activists and political opponents, violating ethical and professional standards. Media control mechanisms in Serbia are no longer just crude forms of censorship. More subtle instruments are used more often: economic pressures, withholding advertising, prosecution, discrediting on social networks. In such an environment, journalists increasingly turn to self-censorship as a survival strategy. The absence of stable funding, insecure working relationships and pressure on editors not to "challenge" sponsors or the government, lead to a situation where independent journalism is reduced to the enthusiasm of individuals or small editorial offices. One of the glaring examples of the influence of politics on the media in the global context was the already mentioned case of the Donald Trump administration's attempt to cancel the funding of the U.S. Agency for Global Media (USAGM), the agency that manages media such as Voice of America, Radio Free Europe/Radio Liberty and Radio Free Asia. Although these are media that act in accordance with US interests, their existence has long been treated as an institutional guarantee of media freedom and the voice of democracy in authoritarian environments. The attempt to shut them down or subordinate them to the direct control of the White House during Trump's term, fueled by dissatisfaction with reporting and the desire for ideological homogenization, showed that even democratic states are not immune to the tendencies of centralized regulation of the media space. In the context of media aspirations towards the creation of national media, we have in some sense also received undeveloped nation states. The mass emergence of nation-states is the most important in a series of increasing hints that the current, although in many respects insufficiently legitimized and insufficiently guaranteed, still relatively stable distribution of nations and other ethnic groups into states and their current borders will not last long and that a state of ethnic dissatisfaction and possible nationalist explosions of planetary proportions are being created. (Simeunović, 2014: 141) This case is a warning for countries like Serbia. Under the guise of patriotism and the constant emphasis of arguments that boil down to the defense of the state and national interests, the silent elimination of all media actors is carried out, taking away the possibility of critical expression and public speech, very often this is done even in developed democracies. It also testifies to the global erosion of the concept of public interest in the media, where even long-standing democratic practices are called into question when they clash with party or personal interests of the powerful and their power. The primary function of the mass media is to label or control the public, or to produce symbols that help define reality. (Vidaković, 2008:301) Despite the general media erosion, there are voices of resistance in Serbia. Independent portals like KRIK, BIRN, Istinomer or New Economy, television N1, Nova S, newspaper Danas, and several weekly newspapers, continue to produce investigative journalism, despite limited resources and constant attacks. Also, social networks and podcasts open up new spaces for critical speech, although they too are not immune to manipulation, "botting" and algorithmic restrictions on visibility. The international solidarity of journalists, the support of organizations such as Reporters Without Borders or the European Federation of Journalists, as well as the activism of civil society, are key to preserving the remaining areas of freedom of expression.

The media scene in Serbia, viewed in a wider global context, reveals deep-rooted tendencies of erosion of professional standards, government pressures and commercialization of public speech. But precisely in that dramatic situation there is also the potential for transformation - if it is recognized that the media are not only means of information, but the foundation of a democratic society. The effort to defend the value of professional journalism is not only the exclusive task of journalists. It is an issue that concerns the whole society, and a consensus on this issue would have to be reached first of all because of the creation of society according to long-established value systems and ways to implement it constantly without exception, because without free media there are no free citizens either. All the described phenomena represent only a fraction of a much wider problem, the media has become a deadly tool in the hands of followers and people who do not understand or consciously keep silent, now by their actions they produce general destruction that spreads like the flame of the fiery element and engulfs everything layers of social communities. Instead of informing, educating and empowering citizens, today's media often serve to abolish their capacity for critical thinking. This transformation has deep political implications, because it is collapsing the foundations of the democratic order. On the one hand, more and more citizens are turning to alternative channels of communication – independent media, social networks, podcasts and blogs. On the other hand, these alternative sources often do not have resources, institutional support or protection, so they are exposed to attacks, discredit and shutdown. In many countries, including Serbia, a "parallel media world" is emerging - a network of journalists and newsrooms that work in the shadows, under constant risk, but which often provide the only accurate picture of reality. Precisely because of this, it is crucial to renew the ethics of public speech, strengthen critical journalism and ensure legal, economic and social protection of media workers. Many domains of human activity are imbued with ethical issues today, which is the case, among other things, with information and journalism, whose importance in modern society is so clear that it is no longer necessary to prove it: in terms of the amount of time that modern man devotes to them, the mass media is in third place, right after sleep and work. (Vidaković, 2009: 185) It is not just about protecting one profession, but about defending society against the increasingly visible collapse of freedom. If we allow the media to remain a tool of repression instead of freedom, the consequences will not only be professional, but civilizational. That is why international cooperation is necessary - both in the field of media rights protection, and in the construction of new, innovative models of financing and development of sustainable media ecosystems. In the era of global connectivity, the fight for media freedom must be joint and solidary. International organizations, the academic community, trade unions, civil initiatives - all of them must become part of that front. Ultimately, the issue of media freedom is an issue of defending the right to think for ourselves. And without that - there is no democracy, no justice, no future. In this context, any analysis of the media scene - be it in Serbia or anywhere in the world - must not remain a mere description, but must also be a call to action. Serbia, as a post-socialist society in a long-term transition process, is additionally burdened by the legacy of party control over public speech. From the nineties to today, the media sphere has gone through formal liberalization, but not essential emancipation. Instead of a state monopoly, we got an oligarchic-market one, in which a few tycoons and politically connected actors control the largest number of influential media. The situation in public services and print media is particularly alarming. RTS, as a public newspaper, functions more and more as a spokesperson for the government, avoiding critical topics and marginalizing opposition views. At the same time, tabloids close to the authorities conduct open discredit campaigns against journalists, activists and political opponents, violating ethical and professional standards. Media control mechanisms in Serbia are no longer just crude forms of censorship. More subtle instruments are used more often: economic pressures, withholding advertising, prosecution, discrediting on social networks.

In such an environment, journalists increasingly turn to self-censorship as a survival strategy. The absence of stable funding, insecure working relationships and pressure on editors not to "challenge" sponsors or the government, lead to a situation where independent journalism is reduced to the enthusiasm of individuals or small editorial offices. The media scene in Serbia, viewed in a wider global context, reveals deep-rooted tendencies of erosion of professional standards, government pressures and commercialization of public speech. But precisely in that dramatic situation there is also the potential for transformation - if it is recognized that the media are not only means of information, but the foundation of a democratic society. Defending that role must not be left to journalists alone. The new world order, in the process of its emergence, most broadly encompassed the spheres of cultural and spiritual life of people and nations. (Mićović, 2001: 70) It is a question that concerns the whole society, because without free media there are no free citizens.

4. CONCLUSION

Independent media represent a crucial pillar of every democratic society, as they enable citizens to access accurate, objective and diverse information, which is essential for making decisions based on accurate information and for active participation in political life. The functioning of political institutions confirmed that they remain empty and lifeless if they are not accompanied by a certain type of political culture, knowledge, values and views that give meaning and meaning to political processes. (Podunavac, 2008: 127) The media in all its forms are the guardians of democracy because it is the media that should expose false information, objectively inform the population about events in the country and abroad, freed from lucrative investments, without the influence of political elites, the media should be creators of objective reality, which unfortunately is certainly not the case in Serbia. Independent media are the foundation of the rule of law in the modern world. Today, it is almost impossible to imagine a political system without the media, because the media is one of the ways of political action. (Petrović, Milaš, 2023:95) Their role in promoting and guaranteeing freedom of expression, access to information and creation of the so-called "public responsibilities" make them an indispensable element of a democratic system dominated by the rule of law. The problem of the concentration of ownership in the media is not a national problem, it has been a global element since ancient times and represents a global obstacle in the creation of objective reality. The only way to achieve free media and an attempt to create an independent media system is an adequate set of legislative measures that would have the task of expressly affecting every deviant form and an effort to avoid objectivity. These are all signs of the effects of civilization, despite propaganda, despite all efforts to control thoughts and produce submission. (Čomski, 2009: 34) Also, media literacy is a segment that represents an area in which there is a lot of work. Media literacy is not only insufficiently developed in the Republic of Serbia, this anomaly has a global character. The proposal is also to strengthen the network of local media, because through local media reporting, it contributes to the creation of general reporting, and thus directly affects truthfulness and transparency as basic factors in free journalism. The proposal for good management, which is actually successful management, is certainly to start all the inhabitants of a country through the process of planning, motivating, organizing and controlling. When an individual creates the impression among people in an organization that their relationship is good with local or republican "powers", that through them they can provide support for investment and development, facilities for the purchase of equipment or product placement, support for sanctioning the opportunistic behavior of an individual or group, then hardly anyone is able to question the correctness of his organizational commitment. (Dunderović, 2007:161) The public always expects objectivity from representatives of political elites, at least as long as they have the trust of the majority that elected them. If he reacts inadequately, the leader risks his future (Đurić-Atanasievski, Draganović, 2012: 159).

The media represent both a tool and a weapon in the hands of citizens, not in the hands of capital owners, but society must recognize this fact, revive it and put it into operation. The Republic of Serbia cannot record its democratic progress without the progress of the free media, which should always record the freedom of media expression as an imperative of development. Aware of the overall circumstances, the owners of large capital use the situation in the country in order to create as many media channels as possible for reporting and thereby realize personal interest. One gets the impression that the general interest is absolutely put aside. Such an observation would not be unusual if it were not about media with a national frequency, which the people of the Republic of Serbia pay for. It goes without saying that this kind of political influence cannot produce a stable economy, but the goal is to create a cheap workforce through misinformation that will find enjoyment in reality shows, avoiding the misinformation that the population is bombarded with every day. It is clear to us that this is a planned degradation of the truth, with a special interest in creating a nation that does not think. It is true that this type of manipulation of the media also takes place under the protectorate of the political elites, who adopted this model of work from developed "democratic" societies such as the USA and the European Union. It is clear to us that the goal of the global powers is to create a population that has a low level of information selection, because in this way the truth is degraded and the lie that serves the interests of the so-called group is valorized. political elites.

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THE STATE OF ENTREPRENEURSHIP IN SERBIA: INSIGHTS FROM ENTERPRISE SURVEYS

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ABSTRACT

The main main of this study is to analyzed the meta-data from World Bank Enterprise Study (WBES) for Serbia. Survey was administrated using WBES Global Methodology. The following indicators have been used: percent of firms that introduced a new product/service over last 3 years, percent of firms whose new product/service is also new to the main market, percent of firms that introduced a process innovation over last 3 years, percent of firms that spend on Research and Development (R&D) in last fiscal year, percent of firms that introduced a new product/service over last 3 years and spend on R&D in last fiscal year, percent of firms with an internationally-recognized quality certification, percent of firms using technology licensed from foreign companies, and percent of firms having their own web site. The sample consisted of 502 business owners and top managers from manufacturing, retail and other service sector. Similar number of respondents from small, medium and large firms have been participated in this study. Firms are from all four regions i.e. Sumadija and Western Serbia, Vojvodina, Belgrade, and Southern and Eastern Serbia. The research conducted from June to December 2024. Data have been processed by relevant statistical methods. The comparison method has been used, too. The results showed that the biggest obstacles were: high tax rates, poorly educated employees, lack of finance, and the informal sector. The gender of top managers revailed the differences between male and female regarding innovation indicators. The recommendations for policy makers will be presented along with strategies and plans. Future study will include all Western Balkan countries.

Keywords: *business environment, entrepreneurship, innovation, Serbia, strategy*

1. INTRODUCTION

Competitive business environment allows private enterprises development through access to finance, high human resource potential, improving competitiveness, exports and development of women and youth entrepreneurship. In 2015, Republic of Serbia implemented important measures that can help the development of entrepreneurship. In the area of improving the business environment, efforts were achieved in the field to facilitate the issuance of building permits (Kontić and Domanović, 2021). Last year Serbia experienced economic growth that driven by transportation, banking, trade, information technology and communications. Solid industrial performance and domestic demand were key factors of growth. Serbia has good level of preparation and made some progress towards market economy (Serbia 2024 Report, 2024). No progress has been made in competition policy. Almost all cluster 2. Internal markets has been assessed as moderate prepared. Competitiveness is one of key areas where improvements are needed. Private sector has an important role in this process.

Therefore, the current state of entrepreneurship in Serbian enterprises is a starting point of analysis. Realible data from World Bank Enterprise Survey have been used in this study. Many studies used the World Bank Enterprise Surveys data at global, regional, and country level. The majority of research papers focused on global and regional level in performing analysis. Serbian enterprises were explored only in a few researches (Vučković amd Džunić, 2023; Krstić and Radulović, 2024; Pitić and Vučković, 2021). These studies treated topics such as organizational factors, innovativeness, and shadow economy. To fill research gap this study pointed to management practices, innovation, access to finance, and obstacles to doing business in Serbian enterprises. The paper is structured into following sections. The next section is devoted to theoretical background; the third one is devoted to the methodology. Fourth section titled the main results and discussions explores the management practices, innovation, access to finance, and obstacles in observed Serbian enterprises. Final section is devoted to conclusions and recommendations for policymakers in Serbia.

2. THEORETICAL BACKGROUND

Relationship between entrepreneurship and economic growth is mostly determined by the number of newly created enterprises (Jaško et al., 2023). Their study suggested a growth of entrepreneurship as well as improvement in competitiveness in Serbia. Another study revealed that the State incentives and business costs have the greatest impact on the entrepreneurship in Serbia (Ateljević et al., 2016). Business environment that encourages development of small and medium enterprises have significant impact (Mihajlović and Trajković, 2021). Small or medium-sized enterprises make important contributions to development of any countries. In recent years, in terms of the intensive competition in the market, globalization and development of technology, innovation and distinction – as a necessity for any company – have led the companies to consider the need for exploiting new opportunities in international arena to gain success in the market and maintain competitive advantage (Kontić and Domanović 2021).

Entrepreneurial companies can contribute to the creation of competitive profit in large companies. Application of the concept of corporate entrepreneurship should enable the formatting requirements for successful market performance and to achieve competitive ability of enterprises in the transition economies. Successful business in the 21st century will depend on the attitude of enterprises regarding the growing need for knowledge and application of the latest technological achievements in the management of the company as well as the ability to transfer information to the target group of consumers and customers in the fastest, most comprehensive and most effective way. Innovative creativity of the company can be encouraged by developing a positive attitude towards the need for constant change, a change in the basis for just innovative activity.

Then, the constant support of new ideas, the interaction of working with others, tolerance and failure to innovative activity, ensuring the absolute freedom of the initiatives of thinking and creating innovation and, finally, recognition of the initiative, lead to the maintaining enterprises' competitive advantage and financial performance in the long term. All business organizations operating in transition economies should stimulate entrepreneurial behaviour preconditions for successful market competition in the global market conditions. Organizational characteristics including communication, formal control, environmental scanning, organizational support and value, have positive impacts on corporate entrepreneurship and organization performance (Janićijević and Kontić, 2025). Strategic framework and financial support for development of entrepreneurship in Serbia include the following:

- Strategy for the Development of Small and Medium Enterprises and Entrepreneurs 2023-2027.
- Developing Financing of the Field of Entrepreneurship in the Republic of Serbia 2022.
- Strategy on Scientific and Technological Development of the Republic of Serbia, and
- Strategy for Support of Development of the Small and Medium Enterprises, Entrepreneurship and Competitiveness.

3. METHODOLOGY

Enterprise Surveys are conducted by the World Bank and its partners across the regions. They focus on many aspects of the business environment using WBES Global Methodology (see Enterprise Surveys, 2021).

3.1. Sample

The size of the enterprise is determined by the number of employees: 5 to 19 (small), 20 to 99 (medium), more than 100 (large). Enterprise with less than 5 employees as well as 100% state-owned are ineligible for Survey. Sector coverage includes the entire manufacturing sector, construction, wholesale, retail, hotel, transportation, storage, communications, information technologies, professional, scientific and technical activities. This is defined across all economies that have been investigated by World Bank Survey.

- Industry:
 - Manufacturing (ISIC Rev. 4.0. codes 10-33)
 - Retail (ISIC Rev. 4.0. code 47)
 - Other Service (ISIC Rev. 4.0. codes 41, 42, 43, 45, 46, 49, 50, 51, 52, 53, 55, 56, 58, 61, 62, 69, 70, 71, 73, 74, 75, 79, 95).
- Size:
 - Small (5 to 19 employees)
 - Medium (20 to 99 employees)
 - Large (100 and more employees).
- Region:
 - Belgrade
 - Vojvodina
 - Sumadija and Western Serbia
 - Southern and Eastern Serbia.

Region	Size	Manufacturing	Retail	Other Services	Total
Belgrade	Small	8	5	39	126
Belgrade	Medium	8	16	10	
Belgrade	Large	12	13	15	
Vojvodina	Small	10	8	25	126
Vojvodina	Medium	4	22	6	
Vojvodina	Large	28	7	16	
Sumadija and Western Serbia	Small	12	8	22	125
Sumadija and Western Serbia	Medium	8	20	5	
Sumadija and Western Serbia	Large	32	7	11	
Southern and Eastern Serbia	Small	6	8	13	125
Southern and Eastern Serbia	Medium	26	15	26	
Southern and Eastern Serbia	Large	17	10	5	
Total		171	138	193	502

*Table 1: Research sample
(Source: Adopted from The Serbia 2024 Enterprise Survey (2024))*

3. 2. Questionnaire

Questionnaire is consisted of the following issues: infrastructure, trade, finance, taxes and business licencing, regulations, corruption, management practices, access to finance, innovation, labor, informality, and perceptions of obstacles of doing business. The questionnaire is gender sensitive regarding ownership, management, and employees' structure.

3. 3. Research methods

Analysis of answer frequency, Pareto analysis of cumulative frequencies and analysis of percentage of occurrence of certain answers have been used. The comparison method has been used on statistical process meta-data. The results from Serbian enterprises have been compared to average score of enterprises from Europe and Central Asia countries.

4. MAIN RESULTS AND DISCUSSION

From various aspects of business environment the management practices, finance, innovation and main obstacles will be analyzed.

4.1. Management practices

The survey tool to collect management practices data is based on the methodology provided by Bloom and Van Reenen (2007). Their study suggested that good management practice is correlated with high productivity, profitability, growth and survival. The main causes of bad management practices are low product market competition, and low level of management control expecially in family enterprises (Bloom and Van Reenen, 2007).

Economy	Management practices index	Score on actions when problem arose	Score on number of performance indicators	Score on achievability of production/service delivery	Score on basis of managers' performance bonuses	Score of knowledge of production/service delivery targets
Serbia	54.7	73.8	46.5	76.9	73.0	23.1
Europe and Central Asia	52.9	77.6	46.6	59.7	51.3	41.9

*Table 2: Main indicators of management practices in Serbia and Europe and Central Asia countries
(Source: Authors' elaboration)*

Management practices index is composed of eight indicator. The higher value suggests better management practices in observed country. In 2024 selected enterprises in Serbia had better management practices index than average enterprise from Europe and Central Asia. The better scores were also achieved in production/service delivery and managers' performance bonuses. The score of knowledge of production/service delivery targets was significantly lower than in Europe and Central Asia enterprises.

Differences in management practices can be explained by characteristics of top managers, corporate governance, or ownership (Bloom et al., 2019a). They are connected to research and development and information technologies. The business environment has strong impact on management practices.

4.2. Finance

A set of questions were about how enterprises financed their operations, various sources to finance investment, loan requirements, bank loans, and other funds. The selected results are presented in Table 3.

Economy	Percent of enterprises that no need for loans	Proportion of investments financed internally	Proportion of working capital financed by banks	Perception index of access to finance as constraint
Serbia	44.4	66.4	9.7	78.3
Europe and Central Asia	59.5	74.5	11	76.4

Table 3: Main indicators of finance in Serbia and Europe and Central Asia countries (Source: Authors' elaboration)

Intensive use of internal funds in financing investments is a sign of potentially inefficient financial intermediation. All presented indicators for Serbian enterprises had similar values as European and Central Asian average enterprise. Over 78% respondents thought that access to finance was a major constraint in Serbian enterprises.

4.3. Innovation

There is a set of questions that describe innovation and use of technology in the observed Serbian enterprises (see Table 4).

Economy	New product/services (in %)	Process innovation in last 3 years (in %)	Own website (in %)	Quality certification
Serbia	21.3	10.5	60.1	19.6
Europe and Central Asia	29.4	20.1	72.6	22.0

Table 4: Main indicators of innovation in Serbia and Europe and Central Asia countries (Source: Authors' elaboration)

Serbian enterprises introduced new product/service in the last three years less than average enterprise from Europe and Central Asia. Only 10% of Serbian enterprises implemented process innovation in last three years compared to 20.1% in Europe and Central Asia.

This is significant difference. In domain of possessing own website and quality certification Serbian enterprises following behind but the difference was less. To stimulate innovation policymakers can use the following policies (Bloom et al., 2019b): direct research and development grants, patent box, skilled immigration, universities' incentives, trade and competition, intellectual property reform, and mission-oriented policies.

4.4. Obstacles

In questionnaire, there is a list of 15 obstacles and the respondents (top managers or owners) ranked them according to assessed relevance for their enterprises. The biggest obstacles are presented in Table 5.

Economy	Access to finance (in %)	Uneducated employees (in %)	Tax rates (in %)	Political instability (in %)
Serbia	15.6	21.6	24.8	3.3
Europe and Central Asia	9.8	22.7	18.8	9.5

*Table 5: Main obstacles in Serbia and Europe and Central Asia countries
(Source: Authors' elaboration)*

Top managers and owner have been identified high tax rates, lack of knowledge and skills, and access to finance as main obstacles for doing business in Serbia. It is worth to mention that political factors perceived as less important. Other study suggested taxes had negative impact on performance of small and medium enterprises in Serbia (Adžić et al., 2023).

5. CONCLUSION

Entrepreneurship is a generator of an economic growth. The results have been suggested that the biggest obstacles were: high tax rates, poorly educated employees, lack of finance, and the informal sector. Based on identified obstacles the main recommendations for policy-makers in Serbia are the following:

- Reduce time and cost of starting a new enterprise
- Guarantee property protection
- Improve the effectiveness of legal system
- Support entrepreneurship courses and programmes at universities
- Promote experiential and learning-by-doing methodologies
- Encourage entrepreneurship training for teachers
- Develop public credit guarantee mechanism
- Establish financial and accounting literacy training for entrepreneurs
- Support the banking sector in facilitating loans to entrepreneurs
- Improve national financial infrastructure
- Promote and publicly celebrate entrepreneurship models through awards.

The results of this study have limited generability. Serbia is one transitional and developing country with specific business environment. Future studies will include other countries such as Montenegro, Bosnia and Herzegovina, and Macedonia.

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TAX TREATY ABUSE AND THE MULTILATERAL INSTRUMENT AS THE PARTS OF THE OECD GLOBAL PROJECT ON BASE EROSION AND PROFIT SHIFTING

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ABSTRACT

This paper deals with issues of the tax treaty abuse and the multilateral instrument (MLI) that made easier negotiation on updating and conclusion of the new tax treaties worldwide. These issues are analyzed as the consistent parts of the Organization for Economic Cooperation and Development (OECD) global project on Base Erosion and Profit Shifting (BEPS), which was initiated and endorsed by the group of the most powerful economy worldwide G-8 (followed by G-20), whose wanted to stop the growing trend of the tax treaties' abuse and tax avoidance by the companies operating in more countries (multinational companies, MNCs). The MNCs used loopholes in tax treaties concluded under the rules of international tax system created at the beginning of the XX century for the world without digitalization and online business. Such a behavior made the global economy unstable and unbalanced the global wealth. The tax treaties' abuse and MLI are the issues in the focus of the BEPS project and the Action plan on BEPS which consists of the 15 actions. The OECD has developed the MLI as a multilateral convention as one of the instruments that would prevent both unwilling phenomena (tax treaties' abuse and tax avoidance by MNCs) and make negotiations between countries that sign and ratify multilateral convention much easier and shorter in time, not only for the revision of their existing tax treaty, but also conclusion of the new tax treaties.

Keywords: *BEPS, MNCs, multilateral instrument, OECD, tax treaty abuse, tax treaty parties*

1. INTRODUCTION

Rapid expansion of the modern world and economies, globalization and digitalization in almost all spheres of modern societies and economies, etc. have made operation of the business and people's lives much easier, but also open many issues. From the aspect of global and national economies, taxation is one of the most triggering question, cause taxes (as public revenues) bring the most money to the national budgets and provide international business is taking burden of its operations around the world. However, several financial and economy crises with global effect made taxation of the international business uncertain. This is a direct consequence of the growing trend between multinational enterprises: they have used crisis and unstable market to escape paying taxes and minimize their global tax burden and business costs. These and other circumstances made international economic organizations intensively working on global projects with an aim to prevent and stop such a practice of the business operating globally. The project that is in the focus of the international community and this paper is the Project on Base Erosion and Profit Shifting (BEPS).

2. INTERNATIONAL TAX SYSTEM AND ITS' REFORM WITH BEPS PROJECT

The international tax system and its rules created after the I World War had served properly for decades and had provided business crossing borders and operating in more than two countries to undertake fair tax burden. However, modern world linked with global economy and financial crises that has occurred in 2008 and continued in following years required different taxation rules for international business. Specially, this has become an urgent after international community has realized the great gap between the profits made and taxes paid by the companies operating in more countries (multinational companies, MNCs).

The most known international economic organization, the Organization for Economic Development and Cooperation (OECD), has made detailed analysis of the world economy and its GDP and found many serious gaps. The group of the most rich economies (the G-8, later G-20) had asked the OECD to do research and make proposal on the actions that would prevent and eliminate tax avoidance and other illegal activities of the MNCs. The result of the research was compiled in the Action Plan on BEPS (OECD, 2013). The Action Plan was fully endorsed by the G20 published at the very end of 2013 year. BEPS consists of 15 action points. Each action treats different issues of business functioning; at first glance it seems that the actions are separated, but actually are very linked. The following issues are in the focus of the BEPS:

1. Addressing the tax challenges of the digital economy;
 2. Neutralizing the effects of the hybrid mismatch arrangements;
 3. Designing the effective controlled foreign companies rules;
 4. Limiting base erosion involving interest deductions and other financial payments;
 5. Countering harmful tax practices more effectively taking into account transparency and substance;
 6. Prevention of granting the treaty benefits in inappropriate circumstances;
 7. Prevention of the artificially avoiding permanent establishment status;
 - 8-10. Actions: Aligning transfer pricing outcomes with value creation;
 11. Measuring and monitoring BEPS;
 12. Mandatory disclosure rules;
 13. Transfer pricing documentation and country-by-country reporting;
 14. Making dispute resolution mechanisms to work effectively;
 15. Developing multilateral instrument to modify bilateral tax treaties.
- (Stojanović, 2017; Stojanović, 2024).

With the BEPS project the OECD has continued working to provide stability in global wealth, fair and transparent taxation, both for the multinational business and countries where the business operations take place, taking into account different aspects of multinationals' business and its taxation. This project has been oriented on development of the new set of standards for prevention of double non-taxation; closer national and international cooperation, greater transparency in reporting and disclosure of certain data; development of a multilateral instrument to amend bilateral tax treaties, and, still, actual harmful tax regimes (OECD, 2013). From the very beginning of the implementation of the BEPS project, states around the world have started following the OECD recommendations and Inclusive Framework defined for each of the actions of the project. The OECD first elaborated the most important actions at the moment: transfer pricing (Actions 8-10); mandatory disclosure rules (Action 12); prevention of the artificially avoiding permanent establishment status (Action 7); neutralizing the effects of the hybrid mismatch arrangements (Action 2); limiting base erosion involving interest deductions and other financial payments (Action 4). In 2017 the OECD published the Multilateral Convention to Implement Tax Treaty Related Measures to Prevent BEPS (multilateral instrument, MLI) as an instrument that would be used for modification of the current bilateral tax treaties and which would give a model for the negotiation and signing of future tax treaties (Action 15). This convention was signed by more than 100 states¹.

¹ The first signing ceremony of the multilateral instrument was held on June 7, 2017, and the convention entered into force on July 1, 2018. Till today 102 states joined this convention, of which 85 states have ratified, accepted or approved it. The result is the modification and amendments of around 1900 bilateral tax treaties.

See: <https://www.oecd.org/tax/treaties/beps-ml-signatories-and-parties.pdf>, Visited: 02/21/2024

On June 29, 2023 the OECD published a new and improved version of the Multilateral convention.

See: <https://www.oecd.org/tax/beps/oecd-launches-new-version-of-the-beps-multilateral-convention-matching-database-to-further-support-international-tax-co-operation.htm> Visited: 02/21/2025

Having in mind that this paper deals with the issues of treaty abuse and MLI, further focus of the paper is on these two issues, which are in the focus of the OECD work on BEPS in recent three years as the actions 6 and 15 of the project. (Stojanovic, 2024)

2.1. Treaty Abuse

Bilateral tax treaties have long served to prevent harmful double taxation and remove obstacles to cross-border trade and investment. Although, the extensive network of more than 3000 treaties worldwide is a good way of fight against tax evasion and avoidance, it also has given rise to treaty abuse and "treaty-shopping" arrangements. Treaty shopping typically involves the attempt to indirectly access the benefits of a tax treaty by a person who is not resident of one of the jurisdictions that are treaty partners. This is often achieved through complex structures and arrangements. Taxpayers engaged in treaty abuse, mainly treaty shopping, but also other treaty abuse strategies, undermine tax sovereignty by claiming treaty benefits in situations where these benefits were not intended to be granted. The consequence of such behavior is that the jurisdictions stay without tax revenues they should get according to the tax treaty. From this point of view, from the very beginning of the BEPS project, tax treaties abuse has been one of the most important OECD concerns as a very undesirable phenomenon. The OECD has defined three ways of tax treaties' abuse:

- The benefits negotiated between the parties to a treaty are extended to residents of a third jurisdiction in a way the parties did not intend, altering the balance of bilateral concessions made by the parties (treaty shopping);
- Income may escape taxation altogether or be subject to inadequate taxation in a way the parties did not intend; and
- The jurisdiction of the residence of the ultimate beneficiary of income has less incentive to enter into a tax treaty with the jurisdiction of source, because residents of that third jurisdiction can indirectly receive treaty benefits from the jurisdiction of source without the need for the third jurisdiction to provide reciprocal benefits.

Within the BEPS Action Plan, the treaty abuse and methods for its prevention are defined under the Action 6, which reads as following:

Develop model treaty provisions and recommendations regarding the design of domestic rules to prevent the granting of treaty benefits in inappropriate circumstances. Work will also be done to clarify that tax treaties are not intended to be used to generate double non-taxation and to identify the tax policy considerations that, in general, countries should consider before deciding to enter into a tax treaty with another country. The work will be coordinated with the work on hybrids. The definition of permanent establishment (PE) must be updated to prevent abuses².

² "In many countries, the interpretation of the treaty rules on agency-PE allows contracts for the sale of goods belonging to a foreign enterprise to be negotiated and concluded in a country by the sales force of a local subsidiary of that foreign enterprise without the profits from these sales being taxable to the same extent as they would be if the sales were made by a distributor. In many cases, this has led enterprises to replace arrangements under which the local subsidiary traditionally acted as a distributor by "commissionnaire arrangements" with a resulting shift of profits out of the country where the sales take place without a substantive change in the functions performed in that country. Similarly, MNCs may artificially fragment their operations among multiple group entities to qualify for the exceptions to PE status for preparatory and ancillary activities." (OECD, 2013), *Action Plan on Base Erosion and Profit Shifting*, OECD Publishing. <http://dx.doi.org/10.1787/9789264202719-en>, p. 19

Under the Action 6 of the OECD/G20 BEPS Project, members of the BEPS Inclusive Framework commit to implement treaty provisions to address treaty shopping as a part of an agreed minimum standard, which is the one of the four BEPS minimum standards. Work on Action 6 also developed specific rules and recommendations to address other forms of treaty abuse and identified tax policy considerations jurisdictions should address before deciding to enter into a tax treaty. The BEPS MLI provides jurisdictions with a mechanism to swiftly implement the Action 6 minimum standard, together with other BEPS treaty-related measures, in their global treaty networks. The Inclusive Framework reviews implementation of the Action 6 minimum standard through a peer review process. (OECD, 2025) Members of the BEPS Inclusive Framework has committed to include in their tax treaties provisions that would ensure a minimum level of protection against tax treaty abuse. They also agreed that some flexibility in the implementation of the minimum standard is required to adapt to the specificities of each jurisdiction and its tax treaties. The minimum standard on treaty shopping requires jurisdictions to include two components in their tax treaties: an express statement on non-taxation (generally in the preamble of the treaty) and one of three methods of addressing treaty shopping.

- **The Express Statement**

As set out in paragraphs 22 and 23 of the Final Report on Action 6³ (OECD, 2015a) jurisdictions have agreed to include in their tax agreements an express statement that their common intention is to eliminate double taxation without creating opportunities for non-taxation or reduced taxation through tax evasion or avoidance, including through treaty shopping arrangements. The following preamble now appears in the 2017 OECD Model Tax Convention: "Intending to conclude a Convention for the elimination of double taxation with respect to taxes on income and on capital without creating opportunities for non-taxation or reduced taxation through tax evasion or avoidance (including through treaty shopping arrangements aimed at obtaining reliefs provided in this Convention for the indirect benefit of residents of third States)" (OECD, 2017).

- **Three Methods of Addressing Treaty Shopping**

Jurisdictions have also committed to implement that “common intention” through the inclusion of treaty provisions in one of the following three forms:

- a principal purpose test (PPT) equivalent to paragraph 9 of Article 29 of the 2017 OECD Model Tax Convention together with either a simplified or a detailed version of the limitation on (tax treaty) benefits (LOB) rule that appears in paragraphs 1 to 7 of the 2017 OECD Model; or
- the PPT alone; or
- a detailed version of the LOB rule together with a mechanism (such as a treaty rule that might take the form of a PPT rule restricted to conduit arrangements, or domestic anti-abuse rules or judicial doctrines that would achieve a similar result) that would deal with conduit arrangements not already dealt with in tax treaties.

As it has been mentioned above, the implementation of the Action 6 minimum standard is subject to a peer review process. The first three peer reviews were carried out in 2018, 2019 and 2020, continued in the following years, and the latest had been carried out in 2024. Each year, the result of the review process is published in the report on prevention on tax treaty abuse - peer review on treaty shopping.

³ OECD (2015a), *Preventing the Granting of Treaty Benefits in Inappropriate Circumstances, Action 6 - 2015: Final Report*, OECD/G20 Base Erosion and Profit Shifting Project, OECD Publishing, Paris.
<http://dx.doi.org/10.1787/9789264241695-en>

2.2. Multilateral Instrument (MLI)

As an instrument to overcome updating of the existing tax treaties and conclusion of the new treaties, the OECD has written the Action 15 in the BEPS Action Plan. In this Action the OECD has introduced one instrument to change all tax treaties (more than 3000 in the whole world) and minimize the efforts and shorten the procedure of negotiation on the new treaties or their revision. The text of the Action 15 on developing MLI reads as following:

Analyze the tax and public international law issues related to the development of a multilateral instrument to enable jurisdictions that wish to do so to implement measures developed in the course of the work on BEPS and amend bilateral tax treaties. On the basis of this analysis, interested Parties will develop a multilateral instrument designed to provide an innovative approach to international tax matters, reflecting the rapidly evolving nature of the global economy and the need to adapt quickly to this evolution.

The text of MLI has been written by the OECD and endorsed by the G-20 as a *Multilateral Convention to Implement Tax Treaty Related Measures to Prevent Base Erosion and Profit Shifting*. It was published by the OECD on the 24 November 2016 and is one of the key milestones in the OECD/G20 Project to tackle BEPS. After it was opened for the signature from 31 December 2016, the signing ceremony was held in June 2017 in Paris. Since that day more than 100 jurisdictions (states) signed and ratified the Convention.⁴

The Convention offers states concrete solutions to prevent treaty abuse transposing results from the BEPS Project into bilateral tax treaties around the world. "It allows governments to implement agreed minimum standards to counter treaty abuse and improve dispute resolution mechanism while providing flexibility to accommodate specific tax treaty policies". As it is explained by the OECD Directorate on Fiscal Affairs, the MLI is a multilateral treaty that would be applied alongside existing bilateral tax treaties modifying their application. It enables bilateral tax treaties to be modified in synchronized and consistent way in order to swiftly implement BEPS related measures. Instead to negotiate with each of the treaty partner and revise or conclude new tax treaty, each state is going to pass ratification procedure in its parliament and modify the whole network of its tax treaties (existing and the future treaties). In the MLI, the OECD use legal principle *lex posterior derogat legi priori*, which means in case that new provision confronts the earlier one on the same matter, the later in time prevails. The principle is explicitly set out in the Article 30 (3) of the Vienna Convention on the Law of Treaties and is directly applied to all bilateral treaties by the states that had ratified the Vienna Convention. (OECD, 2016a). As the OECD defined in the Explanatory Statement on the MLI, the chosen (ratified) provision of the MLI would be applied in one of the following ways/methods:

- (1) in place of an existing provision of a covered tax treaty or
- (2) would be applied to or modify an existing provision of a covered tax treaty or
- (3) would be applied in the absence of an existing provision of the covered tax treaty and
- (4) The last option that states can choose is that the provision of the MLI would be applied "in place of or in the absence of" an existing provision in their tax treaty, which means that the provision of the MLI will apply in all cases (direct reflection of the Article 30(3) of the Vienna Convention).

⁴ Totally 104 states signed and ratified the text of the MLI (data published by the OECD in its database on 10th January 2025); Serbia signed it on the signing ceremony held in June 2017 and ratified it in 2018, when it got into force.

https://www.oecd.org/content/dam/oecd/en/topics/policy-sub-issues/beps-mli/beps-mli-signatories-and-parties.pdf/_jcr_content/renditions/original./beeps-mli-signatories-and-parties.pdf 2025/03/29

The methods chosen by treaty parties reflect their intention expressed in the preamble of their tax treaty, as the OECD stated in the Explanatory Statement on the MLI "The preamble (*of the MLI*) describes the overall purpose of the Convention to implement tax treaty related measures produced as a part of the Final BEPS Package in a swift, coordinated and consistent manner across the network of existing tax treaties without the need to bilaterally renegotiate each such treaty." The OECD further stated that "this statement relates in particular to Article 6(1) (*of the MLI*), which aims to modify the preambles of Covered Tax Agreements to include the following text:

"Intending to eliminate double taxation with respect to the taxes covered by this agreement without creating opportunities for non-taxation or reduced taxation through tax evasion or avoidance (including through tax treaty shopping arrangements aimed at obtaining reliefs provided in this agreement for the indirect benefit of the residents of third jurisdictions)." (OECD, 2016)

It is considered that this is an efficient method to avoid conflicts and misunderstandings between tax treaty parties in application of each of the modified article of their tax treaty. Also, the precise statement in the preamble of the tax treaty is a good indicator of the efficiency of the MLI application as an instrument to prevent tax treaties abuse.

3. CONCLUSION

The world has been significantly changed during last century and rapid changes are made since the beginning of the XXI century. The legal rules created for the world where people and companies physically cross the borders to get from one state to another and do the business, are not fit to the world where almost the whole business is doing online. This made the lives and companies' functioning much easier, but is inevitably linked with many types of abuse. One of the most dangerous phenomenon that occurred at the end of XX century and beginning of the XXI century is tax evasion and tax avoidance related with non-payment of the taxes companies owe for the profits realized as a result of the business they have around the world. And the danger has become very serious as the business is spread over in more countries. The multinational companies are using benefits of such a business, making profit in more countries and do not pay taxes in states where operating; instead of that, they transfer profits in low or zero taxed states. The most powerful economies of the world gathered in G-8/ G-20 engaged the OECD to do research and project that would be a good prevention and fight against this unwilling phenomenon. The result of the OECD engagement is ongoing project on BEPS. Although the project is separated in 15 actions, all of them are very linked and mixed. In this paper, the focus is on the two actions - action 6 on treaty abuse and action 15 on multilateral instrument (MLI) which ratification means automatically updating of the tax treaties of the state that has adopted and ratified MLI. As can be concluded from the above text and analysis - realization of the BEPS and, especially, application of the action 15 have made the world of the tax treaties and international taxation much easier for the states all around the world.

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A COMPREHENSIVE COMPARATIVE ANALYSIS OF RETRIEVAL-AUGMENTED GENERATION (RAG) AND LONG CONTEXT WINDOWS IN LEGAL DOCUMENT ANALYSIS

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ABSTRACT

Recent advancements in natural language processing have greatly enhanced the automated analysis of legal documents. Two leading approaches - Retrieval-Augmented Generation (RAG) and Large Language Models (LLMs) with long context windows - have attracted significant interest for their potential to address the unique challenges of legal text processing. This comprehensive review critically examines these two methodologies in terms of effectiveness, efficiency, and their applications within legal settings. Recent benchmarks show that RAG models outperform long-context models by over 12% in legal question-answering accuracy, particularly on tasks involving multi - document synthesis. RAG systems excel at precise legal question-answering and integrating information from multiple sources but introduce latency and rely on the quality of retrieval mechanisms. In contrast, long-context LLMs streamline document processing workflows and demonstrate strong zero-shot reasoning and holistic document understanding but face challenges related to computational cost and relevance discernment in lengthy texts. These insights offer immediate practical value for legal practitioners aiming to automate complex document analysis or support regulatory compliance through AI tools. The review highlights the domains where each method prevails - including legal research, multi-document synthesis, and regulatory analysis - and argues that future directions will likely leverage hybrid systems combining the strengths of both paradigms. By synthesizing recent empirical studies and emerging benchmarks, this article provides practical insights for legal professionals and technologists seeking to deploy advanced AI for legal document analysis, while identifying key areas for further research and cross-disciplinary collaboration.

Keywords: *ai-driven legal research, legal knowledge extraction, legal question answering, multi-document retrieval, context-aware models, legal ai benchmarks, hybrid retrieval models*

1. INTRODUCTION

In the past few years, the field of legal document analysis has made major progress, especially due to advanced natural language processing methods. Retrieval-Augmented Generation (RAG) and the use of large context windows in Large Language Models (LLMs) are two techniques that have drawn substantial interest.

This comprehensive review aims to critically analyze these methods, focusing on their effectiveness, efficiency, and potential applications within legal settings. By examining the strengths and limitations of each approach, we seek to offer insights into their comparative advantages and identify potential areas for future research and development. However, prior research has rarely examined hybrid RAG and long-context approaches applied to legal documents exceeding 10,000 tokens, particularly in domains such as regulatory compliance and contract law.

2. EFFECTIVENESS OF RAG AND LONG CONTEXT WINDOWS

The effectiveness of Retrieval-Augmented Generation (RAG) and long-context window models in accurately and reliably processing legal documents is a fundamental consideration, reflecting the main requirement for precision and comprehensive understanding within legal applications.

2.1. Retrieval-Augmented Generation (RAG)

Retrieval-Augmented Generation represents a significant leap forward in the field of natural language processing, particularly in the domain of legal document analysis. By combining the generative capabilities of LLMs with external knowledge retrieval systems, RAG offers a powerful solution for generating accurate and contextually relevant responses. The effectiveness of RAG in legal applications stems from its ability to fetch and seamlessly integrate relevant legal texts, statutes, and precedents into the generation process. Recent studies have demonstrated the superiority of RAG-powered models over long-context models in legal question-answering tasks, especially when dealing with nuanced legal, technical, and compliance-related information (Phan et al., 2024; Pipitone & Alami, 2024). This benefit comes from RAG's ability to extract extremely relevant portions from legal texts, which is essential in legal settings where accuracy matters above all else.

The development of benchmarks such as LegalBench-RAG has further emphasized the importance of precise retrieval in overcoming context window limitations and improving citation accuracy (Pipitone & Alami, 2024). RAG systems excel particularly in their ability to answer questions that require information from multiple documents. In legal contexts, where information often needs to be synthesized from multiple sources, RAG's ability to retrieve and integrate information from diverse documents proves invaluable (Phan et al., 2024; Wang et al., 2024). This capability enables legal professionals to efficiently navigate complex legal landscapes that require the consideration of multiple statutes, case laws, and regulatory documents. When set up correctly, RAG systems can create reliable answers by directly referencing relevant legal documents. This helps decrease fabricated information - a common issue with AI systems - and significantly enhances the reliability of the content generated. (Tang et al., 2024; Pipitone & Alami, 2024). In the legal domain, where the accuracy and provenance of information are crucial, this aspect of RAG systems represents a substantial advantage.

However, it is essential to acknowledge the limitations of RAG systems. Introducing a retrieval step inevitably leads to additional latency in the process, which could be problematic in time-sensitive legal applications. Moreover, the performance of RAG systems is heavily dependent on the quality of the retriever and the effectiveness of the integration of retrieved information (Chan et al., 2024). Poor retrieval strategies or low-quality retrievers can significantly undermine the system's performance, potentially leading to the use of irrelevant or incomplete information in the generation process (Jin et al., 2024).

2.2. Long Context Windows (1M Tokens)

The arrival of long-context LLMs has introduced a powerful alternative to RAG systems in legal document analysis. These models, capable of processing and analyzing extensive legal documents in a single forward pass, have demonstrated remarkable capabilities, particularly when fine-tuned for specific legal tasks. One of the primary advantages of long-context models is the simplification of their workflow. These models reduce latency and streamline the processing pipeline by eliminating the need for external retrieval systems. This characteristic makes them particularly suitable for applications where real-time processing is critical, such as time-sensitive legal proceedings or rapid contract analysis (Chan et al., 2024). Long-context models have also exhibited impressive zero-shot reasoning capabilities, enabling them to reference attached forms and definitions without requiring task-specific fine-tuning. This feature is particularly valuable in legal contexts, where understanding and applying unfamiliar legal concepts or terminology is often necessary (Dodíc et al., 2025). Additionally, these models can analyze long legal documents as a whole, enabling them to better grasp how different parts relate to each other. This holistic processing can capture subtle interconnections that might be disrupted in RAG systems due to chunking strategies employed in the retrieval process (Lee & Lee, 2025; Deng et al., 2024). Nevertheless, bigger context windows come with challenges. When models can process more text at once, they might have trouble focusing on what's important, which can make their answers worse. (Tan et al., 2024). This issue is particularly pertinent in legal applications, where the ability to discern and prioritize relevant information is crucial. Additionally, the computational cost of training and deploying long-context models is substantial (Dodíc & Regodic, 2024). This high resource requirement can limit the accessibility of these models, particularly for smaller organizations or individual practitioners in the legal field (Li et al., 2024; Xu et al., 2023).

3. EFFICIENCY OF RAG AND LONG CONTEXT WINDOWS

When analyzing legal documents, how effectively RAG systems and extended context windows perform is very important, especially considering that legal tasks are frequently urgent and many legal groups have limited resources.

3.1. Efficiency of RAG Systems

RAG systems generally demonstrate higher computational resource efficiency compared to long-context models. This efficiency stems from their leveraging of pre-trained LLMs and external retrievers, which allows for a more modular and potentially less resource-intensive approach. The lower computational cost of RAG systems makes them more accessible to organizations with limited resources, potentially democratizing access to advanced legal AI tools (Li et al., 2024; Xu et al., 2023). However, the efficiency of RAG systems can vary significantly depending on the retrieval process's complexity and the knowledge base's size. While these systems perform efficiently for smaller-scale applications, they may encounter scalability challenges when dealing with extensive knowledge bases or complex legal queries that require extensive retrieval and integration of information (Jin et al., 2024; Leng et al., 2024). This scalability issue presents an important area for future research and optimization in developing RAG systems for legal applications. Also, their lower computational requirements make RAG systems particularly appealing for government institutions and legal tech startups that operate under constrained hardware budgets and cannot deploy full - scale LLMs in production environments.

3.2. Efficiency of Long Context Windows

Long-context models are computationally intensive while powerful in their ability to process large amounts of text in a single forward pass.

The training and deployment of these models require significant computational resources, which can present a substantial barrier for smaller organizations or individual legal practitioners (Li et al., 2024; Xu et al., 2023). Despite their ability to process large contexts, these models may introduce latency in real-time applications, particularly when dealing with extremely long documents (Chan et al., 2024). This latency could be problematic in time-sensitive legal scenarios, such as rapid contract review or real-time legal advice during negotiations. The trade-off between the comprehensive processing capabilities of long-context models and their computational demands presents a significant challenge in their widespread adoption in the legal sector. Future research should focus on optimizing these models to reduce their computational requirements while maintaining their performance through efficient attention mechanisms or model compression techniques. Despite these challenges, long-context LLMs hold great promise for real-time legal analysis, where a single-pass understanding of a lengthy document - such as during live contract negotiations or legal audits - can deliver actionable insights without the delays introduced by retrieval stages.

4. APPLICATIONS OF RAG AND LONG CONTEXT WINDOWS IN LEGAL SETTINGS

The unique strengths of RAG and long-context windows lend themselves to different applications within the legal domain. Understanding these applications is crucial for legal professionals and technologists seeking to leverage these technologies effectively.

4.1. Applications of RAG in Legal Settings

RAG systems have demonstrated particular efficacy in legal applications that require precise retrieval and integration of legal texts. They have also shown superior performance in legal question answering compared to long-context models, especially when dealing with nuanced legal, technical, and compliance-related information (Phan et al., 2024; Pipitone & Alami, 2024). This advantage comes from RAG's capability to find and incorporate extremely relevant details from an extensive collection of legal texts, making sure the answers produced are correct and properly backed up. The strength of RAG systems in multi-document question answering is particularly valuable in legal contexts. Legal issues often require synthesizing information from multiple sources, including statutes, case law, regulatory documents, and scholarly articles. The way RAG can quickly find and merge data from various resources allows it to deliver thorough and balanced responses to complicated legal questions. (Phan et al., 2024; Wang et al., 2024). Furthermore, RAG systems have shown promise in legal analysis and reasoning tasks. By combining RAG with multi-stage prompting techniques, researchers have developed systems capable of generating sophisticated legal analyses, emulating the process a legal professional would follow in a common law system (Ng et al., 2024). This application demonstrates the potential of RAG to not only retrieve relevant information but also to apply legal reasoning in a structured and methodical manner.

4.2. Applications of Long Context Windows in Legal Settings

Long-context models excel in applications that require holistic understanding and zero-shot reasoning, capabilities that are particularly valuable in specific legal contexts. One notable application is in the interpretation of building codes and regulations. Long-context models have achieved high accuracy in legal interpretative question-answering tasks related to building codes, demonstrating their ability to process and understand lengthy and complex regulatory documents (Lee & Lee, 2025). The capacity of long-context models to process extensive documents holistically makes them well-suited for multi-document summarization tasks.

In legal settings, where professionals often need to digest large volumes of information quickly, these models can provide cohesive summaries of lengthy legal documents, capturing the essential points and contextual relationships (Godbole et al., 2024). Another promising application of long-context models is in analyzing Environmental Impact Statements and other complex regulatory documents. These models have demonstrated the ability to synthesize complex legal, technical, and compliance-related information from extensive environmental review documents, providing valuable insights for legal and regulatory compliance (Phan et al., 2024). These application-specific advantages reveal a clear complementarity between the two approaches. While RAG offers unparalleled precision and traceability in legal QA workflows, long-context LLMs enable comprehensive understanding of full legal documents and regulations in a single pass. The practical implications of this distinction are significant - legal teams can leverage RAG systems for tasks that require pinpoint accuracy and justification, such as legal advice letters or case law referencing, while using long-context models for fast document reviews, summarization, and due diligence processes that demand breadth and speed.

Criteria	RAG	Long Context Windows
Effectiveness	Excels in legal question-answering and multi-document QA	Effective for building code interpretation and multi-document summarization
Efficiency	Lower computational cost but may introduce retrieval latency	Higher computational requirements and potential latency in real-time applications
Applications	Legal question-answering, multi-document QA, legal analysis	Building code interpretation, multi-document summarization, environmental review comprehension

Table 1: Comparative analysis table

(Sources: Phan et al., 2024, Pipitone & Alami, 2024, Li et al., 2024, Xu et al., 2023, Ng et al., 2024, Lee & Lee, 2025, Godbole et al., 2024, Chan et al., 2024)

5. FUTURE DIRECTIONS AND HYBRID APPROACHES

As legal document analysis continues to evolve, researchers and practitioners increasingly recognize that the choice between RAG and long-context windows is not necessarily binary. Instead, the future of legal AI may lie in hybrid approaches that combine the strengths of both methodologies. One promising direction is the development of dual-perspective RAG systems, such as LongRAG. These systems have been shown to outperform both traditional RAG and long-context models in legal question-answering tasks (Zhao et al., 2024; Jiang et al., 2024). These hybrid systems offer a more comprehensive approach to legal document analysis by leveraging the precision of RAG's retrieval capabilities and the full understanding of long-context models. Another original approach is the development of dynamic direction-finding systems, represented by the Self-Route model. This system intelligently points queries to either RAG or long-context models based on model self-reflection, optimizing performance while possibly reducing overall computational costs (Li et al., 2024). Such adaptive systems signify a promising direction for balancing the trade-offs between precision, comprehensiveness, and efficiency in legal AI applications. Future research should also address the current limitations of RAG and long-context models. This could include developing more sophisticated retrieval mechanisms for RAG systems that can handle the complexities of legal language and concepts. For long-context models, efforts should be directed towards improving their ability to maintain focus on relevant information even in extremely long documents and reducing their computational requirements.

Additionally, more comprehensive benchmarks and evaluation metrics are needed to be tailored explicitly to legal applications. While benchmarks like LegalBench-RAG (Pipitone & Alami, 2024) represent a step in the right direction, developing standardized evaluation frameworks that capture the nuances of legal reasoning and analysis would greatly benefit the field. This paper contributes to that effort by identifying precise domains where each architecture excels and by framing the potential of hybridization not merely as an optimization, but as a structural shift in how legal AI systems can be designed. The proposed analysis thus provides a conceptual foundation and empirical motivation for future hybrid systems tailored specifically to the legal domain.

6. CONCLUSION

When comparing Retrieval-Augmented Generation with long context windows for analyzing legal documents, each method has its own strengths and limitations. RAG systems are particularly good at finding and combining specific legal texts, which works well when information needs to be pulled from various sources. On the other hand, models that can handle long contexts offer full understanding of documents and display impressive reasoning skills without needing specialized training, making them valuable for deeply analyzing large legal documents. The choice between these approaches ultimately depends on the specific requirements of the legal application at hand. However, the emerging trend towards hybrid systems that combine the strengths of both RAG and long-context models suggests a promising direction for future developments in legal AI. Legal experts and AI developers need to work together as the field grows. This partnership will help create AI technologies that truly understand legal practices and needs, resulting in better and more ethical AI systems for analyzing legal documents. To sum up, legal document analysis will probably advance through the smart combination of RAG and long-context windows, along with continued studies to overcome their present shortcomings. Both methods show great promise for transforming how legal documents are processed. As these technologies continue to advance, they promise to greatly enhance the efficiency and accuracy of legal work, potentially transforming the practice of law in the digital age. This research highlights that neither RAG nor long-context models are universally optimal. Their complementary behavior reveals that task-specific alignment and adaptive orchestration between retrieval and reasoning components will be essential in building robust legal AI systems.

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ANTI-GLOBALIST MOVEMENT

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ABSTRACT

Anti-globalism is an ideology that opposes the processes of globalization, i.e. the increasing economic, political, cultural and technological connectivity and integration throughout the world. This movement criticizes the negative aspects of globalization and advocates for changes aimed at protecting national identities, state sovereignty, labor rights, the environment and social justice. Some anti-globalists advocate for strengthening national identities and state sovereignty, and oppose the excessive power of international institutions and agreements that, in their opinion, threaten national interests. Anti-globalists often emphasize the negative impacts of globalization on the environment, including the degradation of natural resources, pollution and climate change. Therefore, they advocate for environmental protection measures and sustainable development.

Keywords: *anti-globalism, criticism, identities, environment*

1. INTRODUCTION

The anti-globalization movement is a social, political, and economic movement that opposes the processes of globalization, i.e. the increase in economic, political, cultural, and technological connectivity and integration throughout the world. The movement seeks to highlight the negative aspects of globalization and advocates for changes aimed at protecting national identities, state sovereignty, labor rights, the environment, and social justice¹. Many anti-globalizationists believe that globalization benefits multinational corporations and capital at the expense of workers, local economies, and the environment. They advocate for alternative economic systems that are fairer and more focused on social needs. The preservation of the national, cultural, and linguistic identities of peoples is the goal of a large part of anti-globalizationists.

2. DEFINING OF ANTIGLOBALISTIC MOVEMENT

The anti-globalization movement is a globally interconnected network of individuals, social groups, and organizations that oppose globalization, or more precisely, economic globalization. See a more detailed definition, as well as some common misconceptions about this topic. There is resistance to the growing power of multinational corporations along with the consequences they have on people's daily lives and the environment. The term anti-globalization is used to refer to opponents of the globalization process, that is, various social and political movements, ideologies that oppose globalization processes. The anti-globalization movement developed in parallel with the globalization process². In the last years of the twentieth century, anti-globalization tendencies have been growing, gathered around a not-so-homogeneous group composed of different movements, which are linked by common interests aimed at combating poverty, dirigisme, and exploitation of all kinds by the protagonists of the new world order.

¹ Latinović, Đ., 2019. Alternativna globalizacija. in: *Pregled, časopis za društvena pitanja*. Sarajevo. p. 90-92.

² *Anti Globalization Movement*. <https://www.studysmarter.co.uk/explanations/macroeconomics/international-economics/anti-globalization-movement/>. april 2025.

The goal of anti-globalization movements is to oppose the growing processes of globalization and the consequences they produce in society. The anti-globalization movement is mostly focused on economic globalization and the ideology of neoliberalism, but certainly also on other aspects of globalization, for example, on political globalization, criticizing the creation of global institutions and a global system of governance, or in the domain of culture, criticizing the so-called Westernization and supporting the preservation of national cultural identities³. The form of the anti-globalization movement itself is extremely undefined. It is made up of a network of different actors, thus bringing together supporters of different ideologies such as: feminist movements, ecological movements, labor movements, political and other various social movements, which sometimes makes it difficult to define and direct the movement itself. These movements are described as anti-globalist – against globalization or alterglobalist – for a different globalization. The alterglobalist movement, which is actually made up of several movements, includes, among others: "Direct Action Network", Reclaim the Streets, Black Blocs, White Suits, ATTAC and various anarchist groups or groups inspired by the ideas of anarchism and Westernism. These groups advocate for democracy and consensus as forms of political decision-making through street demonstrations with elements of festivals, street theater and non-violent action⁴. The alterglobalist movement was given a special impetus by the establishment of the World Social Forum in 2000 in Porto Alegre, conceived as a counterpart to the World Economic Forum in Davos with the idea of opposing corporate globalization. The Worldsocial forum managed to gather a large number of small organizations and connect them in the fight against globalization⁵. The anti-globalization movement represents efforts to oppose the current processes of globalization. It is most strongly expressed in resistance and protests directed towards global economic processes. The movement is heterogeneous and includes different, sometimes opposing views in ideology and strategies of opposing globalization. In part, the anti-globalization movement also directs its criticism towards political ones, provided that it does not take place using violent methods that the main protagonists apply today. Another fact that is indisputable is that the modern world is so diverse in all spheres of its life that any attempt to force it into any molds must be experienced as violence against natural laws, the way and forms of human life, and as such is doomed to failure, as it represents a blow to different civilizations and can thus cause great historical dangers with unpredictable consequences. Therefore, the only alternative to violent globalization is the unity of the world, interconnectedness and interdependence of differences. An important prerequisite for this is the preservation of self-awareness, national and cultural identity, traditions and the possibility for each people to freely and unhinderedly decide on their own destiny and on relations and cooperation with others⁶.

3. HISTORY OF THE ANTI-GLOBALIST MOVEMENT

The history of the anti-globalization movement dates back to 1995, when the World Trade Organization (WTO) was formed. The first major anti-globalization rally was held in late 1999 in Seattle, where more than 100,000 protesters gathered on the occasion of the World Trade Organization ministerial meeting.

³ Warner, A., 2005. A Brief History Of The Anti-Globalization Movement. in: *University of Miami International and Comparative Law Review* *University of Miami International and Comparative Law Review*. Volume 12 Issue 2. p. 240.

⁴ Warner, A., 2005. A Brief History Of The Anti-Globalization Movement. in: *University of Miami International and Comparative Law Review* *University of Miami International and Comparative Law Review*. Volume 12 Issue 2. p. 241-242.

⁵ Latinović, Đ., 2019. Alternativna globalizacija. in: *Pregled, časopis za društvena pitanja*. Sarajevo. p. 93.

⁶ Jerotijević, Z., Jerotijević, D. and Matić, A., 2017. *Međunarodni odnosi i međunarodne organizacije*. Poslovni i pravni fakultet. Univerzitet MB. Belgrade. p. 212-213.

From there, anti-globalists began a global campaign and continued it with mass rallies from Washington, through Prague, Gothenburg, Quebec, Genoa, Sydney, Florence, Barcelona, Evian, Geneva and Bombay. Take the Streets is a collective founded in London in 1991 with the aim of rising up against the auto industry as the embodiment of capitalist philosophy. Advocating for cycling, reducing the number of cars, the collective's activists organize parties on the streets of large cities where people dance and play music. The characteristics of the General People's Action are:

- 1) a very clear rejection of capitalism, imperialism and feudalism, all trade agreements and governments that promote destructive globalization;
- 2) rejection of all systems of absolutism and discrimination, especially patriarchy, racism and religious fundamentalism of any kind;
- 3) a combative stance, since we do not believe that lobbying has a significant impact on biased and undemocratic organizations
- 4) a call for direct action and civil disobedience, support for the struggles of social movements and all forms of resistance that increase respect for life and the dignity of dependent people; as well as the construction of local alternatives to global capitalism;
- 5) an organizational philosophy based on decentralization and self-government⁷. Activists usually organize themselves as affinity groups, non-hierarchical groups made up of people from the same area or neighborhood who share common political goals. Affinity groups were first practiced by Spanish anarchists in the nineteenth century, and in the 1970s, this method of organizing was also used in the anti-nuclear movement in the United States. These groups are useful because they are very small, making it impossible for police and informants to infiltrate them⁸.

In 2000, anti-globalists decided to formalize and institutionalize their joint action, and that same year they founded the World Social Forum as a counterpart to the World Economic Forum held in Davos, Switzerland. In the past seven years, dozens of protest rallies and actions have been held around the world, gathering an increasing number of supporters. Finally, in 2002, in Florence, at the European Social Forum, over half a million people from all over Europe gathered on the last day of the peace march. In the Brazilian city of Porto Allegro, conceived as a counterpart to the World Economic Forum in Davos with the idea of opposing corporate globalization. The World Social Forum has managed to bring together a large number of small organizations and unite them in the fight against globalization⁹. The anti-globalization movement represents efforts to oppose the current processes of globalization. It is most strongly expressed in resistance and protests directed towards global economic processes. The movement is heterogeneous and includes different, sometimes opposing views in ideology and strategies of opposing globalization. In part, the anti-globalization movement also directs its criticism towards political ones, provided that it does not take place using the violent methods that the main protagonists apply today. Another fact that is indisputable is that the modern world is so diverse in all spheres of its life that any attempt to force it into any molds must be experienced as violence against natural laws, the way and forms of human life, and as such is doomed to failure, as it represents a blow to different civilizations and can thus cause great historical dangers with unpredictable consequences. Therefore, the only alternative to violent globalization is the unity of the world, interconnectedness and interdependence of differences.

⁷ Latinović, Đ., 2019. Alternativna globalizacija. in: *Pregled, časopis za društvena pitanja*. Sarajevo p. 94-95.

⁸ Jerotijević, Z., Jerotijević, D. and Matić, A., 2017. *Međunarodni odnosi i međunarodne organizacije*. Poslovni i pravni fakultet. Univerzitet MB. Belgrade. p. 208.

⁹ Latinović, Đ., 2019. Alternativna globalizacija. in: *Pregled, časopis za društvena pitanja*. Sarajevo. p. 95-96.

An important prerequisite for this is the preservation of self-awareness, national and cultural identity, traditions and the possibility for each people to freely and unhinderedly decide on their own destiny and on relations and cooperation with others.

4. ANTIGLOBALISTIC MOVEMENT IN DEVELOPED COUNTRIES

Although the effects of globalization are most pronounced in underdeveloped countries, the greatest support for the anti-globalization movement comes from developed Western European countries. This support comes considering the fact that developed countries were the first to feel the drawbacks of globalization. Some analysts believe that anti-globalization movements will intensify in Western European countries during crises in their economies. The reason for this rise is the propensity for crises in the existing monetary system, which in recent years has caused major financial crises with significant consequences for employment. Anti-globalization movements, led by the working class, fight against the liberalization of international trade, which in developed countries leaves many workers without jobs. Namely, this liberalization allows the relocation of production to less developed countries where labor costs are lower, and multinational companies use this tactic regardless of the violation of labor rights in their home countries. For example, in the United States at the end of the 20th century, a large number of workers in the steel industry lost their jobs. Numerous environmental movements also oppose globalization because of its negative environmental impacts. Multinational companies do not respect environmental standards and often relocate production to countries with weaker regulations, which leads to pollution in developed countries as well. Environmental movements operate on a global scale, because environmental protection has become a global issue. There are anti-globalization movements that focus on the problems of political globalization and its consequences for nation states. These movements seek to protect national interests and the sovereignty of states, considering global institutions insufficiently democratic and not promoting the rule of law, but rather to advocate for their own global interests. They also warn of the political power of multinational companies in developing countries¹⁰. Initially, the impact of anti-globalization movements was primarily at the national level, but the process of globalization has led to both processes taking place simultaneously. We are witnessing a time in which protests, rallies and anti-globalization activities have become commonplace. In this century, numerous anti-globalization organizations have begun to operate at the transnational level, coordinating their activities and defining their goals in a world subject to globalization. Although perhaps not with the same strategic foundation as globalization, these organizations are active and tend to expand and participate in global issues¹¹.

4.1. Anti-globalization movement in underdeveloped countries

Underdeveloped and less developed countries are more affected by globalization than developed countries. Data from international economic organizations on the development of the economy in underdeveloped countries show progress in industrialization, but mainly through the work of multinational companies. Although income may be growing, a large part of this income flows abroad, which has led to anti-globalization movements in these countries. The main parts of anti-globalization movements are parties with pro-socialist and national socialist orientations. Such groups seek to improve the living standards of their populations, believing that the profits extracted from their countries are used inappropriately. In less developed countries, anti-globalization movements are often disorganized and have limited means of action compared to movements in developed countries.

¹⁰ Sremčev, A., 2020. *Procesi globalizacije i antiglobalizacije i njihov uticaj na bezbednost Balkana*. master work. mentor: Dragan Simeunović. University in Belgrade. p. 68 -69

¹¹ Ibid. p. 70.

In recent years, non-governmental organizations have begun to act on a global scale, highlighting the negative consequences of globalization. An example of such an organization is the African Trade Network (ATN), which is made up of unions, social movements, civil society groups and NGOs from across Africa, and was formed in 1999 with the aim of opposing the liberalization it promotes.

5. MAIN IDEAS AND IDEOLOGY OF THE ANTI-GLOBALIST MOVEMENT

The anti-globalization movement stems from different ideological and value foundations, and within it there are different perspectives and motivations;

Main ideas and values:

- Nationalism: Part of the movement advocates nationalist ideas, emphasizing the importance of state sovereignty and the preservation of national culture and identity.
- Anti-capitalism: The other part of the movement focuses on criticizing the capitalist system, emphasizing the injustices and inequalities resulting from globalization, and advocates for a fairer distribution of resources.
- Ecology: Ecologically oriented anti-globalists emphasize the negative impacts of globalization on the environment and natural resources and fight for environmental preservation and sustainable development.
- Social Justice: This segment of the movement fights to protect workers' rights, reduce economic inequality, and improve social security.

Different perspectives within the movement:

- Nationalist perspective: Stresses the importance of state sovereignty, the protection of national interests, and traditional values.
- Anti-capitalist perspective: Criticizes capitalism for economic exploitation and injustice, and advocates for alternative economic systems based on social justice.
- Ecological perspective: Focuses on protecting nature and the environment, and advocates for environmentally sustainable practices in business and society¹².
- Socio-legal perspective: Fights for workers' rights, equal opportunities, and a fair distribution of wealth¹³.

Influence of political, economic, and social factors:

- Politics: Political factors, such as inequality in the distribution of power and influence, can fuel the anti-globalization movement.
- Economy: Economic inequality, unfair trade relations, and economic crisis can increase motivation to join the movement.
- Society: Social factors such as discontent, job loss, and lack of access to basic necessities can mobilize people to support anti-globalization ideas and actions.

6. CONCLUSION

The anti-globalization movement criticizes the global economic system, which is often perceived as unjust and exclusionary. Anti-globalization activists highlight the shortcomings of neoliberal capitalism and advocate for changes that would lead to greater social justice and balance. Many anti-globalization activists advocate for the protection of national interests and the sovereignty of states against the excessive power of multinational corporations and global institutions. This aspect of the movement emphasizes the importance of preserving national identities and autonomy in the face of globalization.

¹² *Anti Globalization Movement*. <https://www.studysmarter.co.uk/explanations/macroeconomics/international-economics/anti-globalization-movement/>. april 2025.

¹³ *Anti Globalization Movement*. <https://www.studysmarter.co.uk/explanations/macroeconomics/international-economics/anti-globalization-movement/>. april 2025.

A significant part of the anti-globalization movement is dedicated to environmental protection and sustainable development. Activists oppose the exploitation of natural resources, pollution, and climate change, and advocate for policies and practices that would preserve the planet for future generations. The anti-globalization movement plays a role in raising awareness about the negative consequences of globalization, such as economic inequality, job losses, worker exploitation, and environmental degradation. Through its activities, this movement helps people better understand the complexity of global processes and their impact on everyday life. It also fights for a more just world in which social rights are protected, economic power is evenly distributed, and the environment is preserved. Activists strive to bring political and economic elites responsible for injustice and exploitation to justice and to promote policies that favor the majority of the population.

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RIGHT TO PROTECTION OF THE INDICATION OF GEOGRAPHICAL ORIGIN OF PRODUCTS WITH REFERENCE TO CONSUMER PROTECTION

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ABSTRACT

Historically viewing, indications of geographical origin of product have been used differently depending on the period in which legal theory and legislative regulations changed. In the earlier period geographical indications of product origin were either neglected, or no broad scope for protection of products and services with this label was recorded. After the 1980s it was increasingly used, to be growingly utilized for protection of products and services in the period of independence, that is, gaining of statehood of the Republic of Serbia in 2006. So today we have a large number of products protected by geographical indications of origin, as well as a great number of applications for its protection. In this way, it is possible to familiarize consumers at home and abroad with the properties of goods as well as to familiarize foreign markets with Serbian trademarks and their producers.

Keywords: *content of protection, geographical origin of product, indications of origin, registration and protection of products*

1. INTRODUCTION

In the following presentation, the author points to the historical development of the legal principle of geographical indications of origin of products. The indication of geographical origin is a form of intellectual property that links a product to a specific region, reflecting qualities, reputation, or characteristics essentially attributable to that location. Its protection serves both producers and consumers, with increasing significance in global trade and consumer awareness. Protecting geographical indications is not only a matter of intellectual property law but a core component of consumer protection. It strengthens market transparency, supports informed consumer choice, and ensures product authenticity. For effective implementation, awareness, enforcement, and international cooperation are crucial.

2. HISTORICAL REVIEW OF THE PROTECTION OF GEOGRAPHICAL ORIGIN OF PRODUCTS

The protection of geographical indications of origin on the territory of Serbia can be observed through different periods from 1918 to 2010. This period basically presents the development of the legal principle of geographical indications of origin from the creation of the Kingdom of Serbs, Croats and Slovenes and lasts until World War II. The second period begins from the end of World War II with the establishment of the Democratic Federal Yugoslavia, which changed its name to the Federal Republic of Yugoslavia and ending with Serbia and Montenegro, and the third period from the independence of Serbia in 2006 as the legal successor of the previously mentioned states. At the time of the establishment of the Kingdom of Serbs, Croats and Slovenes in 1918, legal particularism, i.e. different legal systems were in force, thus the newly created state also took over the laws of those systems (the law of the Kingdom of Serbia, the Kingdom of Montenegro, Austrian law, Hungarian law and Sharia law).

The first regulation that provided legal protection to all categories of industrial property was the Decree on the Protection of Industrial Property in 1920. The first Law on the Protection of Human Property was passed in 1922. In paragraph 51 this Law excluded from protection the trademark, indications of type, indications that showed the place of production only, indications that did not correspond to the true state and might have caused fraud. In paragraph 154, the Law determined sanctions for fraudulent advertising if a person referred to a patent, or other industrial property right that did not actually exist¹. In 1929, Yugoslavia concluded a trade and navigation agreement with France. By the agreement, both contracting parties undertook to suppress any misuse of the indications of origin of the other contracting party's viticultural products on their territory.² In 1930, the Law on the Suppression of Unfair Competition, which contained provisions on the protection of indications of origin (paragraphs 3 to 9) was passed. Paragraph 3 contained a definition of a false indication of origin and therefore indirectly a definition of an indication of origin. Paragraph 8 underlined the difference between ordinary indications of origin and name of origin together with the name of region, as the Law called them, where the latter were labelled as indications of origin of goods "produced in specific regions whose climate or soil affect the properties of goods"³. In the period from 1945 to 1992 the Law on the Protection of Indications of Origin in Yugoslavia chronologically looked as following: The period from 1945 to 1950 was a period of administrative regulation of economy, so that a market economy could not be discussed. In 1950, the Law on the Management of State-Owned Enterprises and Higher Economic Associations by Employees⁴ transferred the management of economic enterprises to the employees. The Decree on the Establishment and Activities of Trading Enterprises in 1952 stipulated that trading enterprises had to adhere to trade customs and practices in their operations, and were obliged to apply the principles of fair competition between socialist enterprises⁵. In 1957 the Wine Law⁶ was passed, which in Article 2 divided wine according to the type of grapevine, the method of production and the composition of the wine into natural, special, sparkling and the wines produced from directly commercial hybrids. In 1962, the Law on Trade of Goods and Services with Foreign Countries and the Law on the Regulation of Business Relations on the Market were passed⁷, which regulated unfair competition which was considered to be caused by placing false labels of the quality, origin and producer of goods. In the 1970s, the protection of geographical indications for wines and grape products was carried out by special laws passed by the Republics and Provinces. In 1981, the Socialist Federal Republic of Yugoslavia passed the Law on the Protection of Technological Inventions, Technical Improvements and Distinction Signs⁸. According to this Law, the indication of product origin was a distinctive sign. Article 37, paragraph 1, stipulated that an indication of origin protected the geographical name of a product whose special properties were predominantly determined by the place or area where it was produced, if these properties were acquired naturally under the influence of the climate or soil, or by a standard method and procedure of production or processing. An accumulation of human and natural factors was necessary, which allowed a larger number of products to be protected by the protection of an indication of origin. An indication of origin was established by entering the geographical name of the product and the type of product to which that name referred into the Register of Protected Indications of Origin.

¹ Верона, А. (1965). Нелојална реклама. Особито заштита географских ознака порекла. Београд. 14.

² Шуман, Ј. (1939). Нелојална утакмица. Коментар Закона о сузбијању нелојалне утакмице. Београд. 497.

³ Прица Р. (1965). Сузбијање неистинитих ознака порекла и заштите имена порекла. Београд. 16.

⁴ Службени лист ФНРЈ бр. 96/46.

⁵ Службени лист ФНРЈ бр. 6/52.

⁶ Службени лист ФНРЈ бр. 31/57.

⁷ Службени лист ФНРЈ бр. 30/62.

⁸ Службени лист СФРЈ бр. 34/81, 3/90 и 20/90.

This Law had legal effect on the legal protection of geographical names of products until the enactment of the Law on Geographical Indications of Origin in 1995⁹, and then in 2006, a new Law on Geographical Indications of Origin was adopted¹⁰.

3. CURRENT LEGAL REGULATIONS

The need to harmonize this area of intellectual property law with international and European Union standards, as well as the need to create a legal framework for the legal protection of geographical indications of origin, products and services originating in the Republic of Serbia, led to the adoption of the Law on Geographical Indications of Origin of the Republic of Serbia in 2010¹¹. The right to protect a geographical indication of origin can be viewed in an objective sense and as a subjective right. In an objective sense, it, like other legal areas, normatively regulates the conditions and content of protection enjoyed by entities that protect their goods or services with the name of a geographical indication of origin. In a subjective sense, the subject of the right to a protected geographical indication of origin is exclusively the right that belongs to that entity, and the content of that right is the authorization that the entity has gained for labelling products or services protected by the indication of origin. Geographical indications of origin are appellations of origin and geographical indications. Geographical indications of origin are used to identify natural, agricultural, food and industrial products, handicrafts and services. An appellation of origin is the geographical name of a country, region or locality, which labels a product originating there, whose quality and special properties are exclusively or essentially determined by the geographical environment, including natural and human factors, and whose production, processing and preparation as a whole take place in a specific geographical area. A geographical indication is a label that identifies certain products as originating in the territory of a specific country, region and/or locality within that territory, where a certain quality, reputation or other characteristics of the product can essentially be attributed to its geographical origin and whose production and/or processing and/or preparation take place in a specific limited area. Comparative law regulates geographical indications and appellations of origin differently. For example, French law is characterized by a division into geographical indications and appellations of origin. French legal theory distinguishes two types of geographical indications of origin. One broader category consists of l'indications de provenance (indications of origin) and the other narrower l'indications d'origine (appellation of origin). L'indications de provenance is an indication of origin that indicates that the product is labelled with it in a specific place, province or country. This label is by a rule only information about the place where the product was manufactured, i.e. it is an identification of the product's origin. L'indications d'origine is more complex than l'indications de provenance, because it has an important function of quality guarantee for goods whose properties are conditioned by the climatic or other geographical characteristics of a particular place or region, or by possible human factor, traditional production processes that are related to the special skill or adroitness of the persons living in that area¹². The connection between the origin of a product and its properties in legal theory is called exclusivite d'origine¹³. The cited French legal theory indicates a similarity with our latest normative solution, but we should take into account that France is one of the first countries to introduce protection of geographical indications of origin, so the regulations and legal theory in this domain have not changed much.

⁹ Сл. лист СРЈ, број 15/1995.

¹⁰ Сл. лист СЦГ, број 20/2006.

¹¹ Закон о ознакама географског порекла (Сл.гласник РС, бр. 18/2010 и 44/2018-др.закон).

¹² Roubier, P. (1954). Le droit de la propriete industrielle. Paris.767.

¹³ Roubier, P. цит.дело. 762.

In our legal theory, the geographical indication of origin of a product was previously treated little, but it is noticed that the term exclusivity of origin is used¹⁴. Apart from the French concept of geographical names of products, there is no single concept of protection of an indication of origin in other comparative laws. "To be precise, three main forms of protection can be distinguished. One form of protection, which is achieved on the basis of the rules on the suppression of unfair competition, aimed to prevent the fraudulent indication of goods or services with an indication of geographical origin. More specifically, a person who labels his goods with the name of a geographical location from which the goods do not actually originate, misleads the consumer about the origin of the product, thereby committing an act of unfair competition. The second and third forms of protection are aimed at protecting not only the formal but also the essential relatedness that exists between the geographical location whose name labels certain goods or service and those goods and services. Namely, the right to use an indication of geographical origin is recognized only to that economic entity whose goods or services correspond in terms of qualitative characteristics, to the reasonable expectations that participants in trade have towards goods or services originating from that location. Thereby, the second form of protection is achieved through a collective trademark, where the Act on the Collective Trademark stipulates conditions regarding the origin and quality of the product, which each user of the collective trademark must fulfil. The third form of protection is achieved on the basis of special regulations on the protection of geographical indications of origin. All three forms of protection can be applied in Serbia"¹⁵. In our previous legal theory, geographical names of products were divided into "true" and "false" geographical names. True geographical names of products are considered to be those that contain information on the geographical name of the product, indicating the specific properties of the product which are the result of natural factors, the influence of climate, soil, etc. and/or the method of production or processing. In the minds of buyers and consumers, the true geographical names of products, in addition to the geographical name, which indicates the origin of the product, create an idea of the quality properties of the product, which is why buyers usually buy the product. False geographical names of products include the notion, but do not refer to geographical origin of such an important product. False names include fantastic names, names of type and pseudo-geographical names that are subtypes of the type name. a) Fantastic geographical names of products, by their content and meaning, exclude any real connection between the specified place or region and the origin of the product. Fantastic names are more or less invented names. An example is the name "Eskimko" for ice cream, which associates with the Eskimos, that is, with the northern ice regions, but has no real connection with them, because ice cream is not produced at the North Pole. Such examples include "MONTBLANC" for fountain pen etc.¹⁶ b) Type names are names that indicate a specific type of goods. Namely, these are names that, according to the understanding of interested market participants are indications of a type. These names cannot enjoy legal protection. Pseudo geographical names are names that indicate the name of a product from a region, but substantially have nothing to do with that region (Frankfurt sausages are named after the butcher Frankfurter, not the city of Frankfurt)¹⁷. "Abuses of geographical names of products protected by geographical indications of origin are carried out due to their fame among consumers in order to achieve greater profits. Abuses can be carried out by using delocalizing data (e.g. Bavarian beer, produced in Austria) or by using a foreign language to label domestic goods in a way that misleads the buyer as to their origin (British cherry)."¹⁸

¹⁴ Прица, Р. (1965). Сузбијање неистинитих ознака порекла и заштита имена порекла. Београд. 12.

¹⁵ Марковић, С.; Поповић, Д. (2018). Право интелектуалне својине. Београд. 173.

¹⁶ Верона, А. (1965). Нелојална Реклама. Особито заштита географских ознака порекла. Београд. 193.

¹⁷ Верона Албер цит. дело. стр. 194

¹⁸ Бесаровић В. (2000). Интелектуална својина, индустријска својина и ауторско право. Београд. 179.

Geographical indications of origin of a certain type of goods should influence the buyer to gain a precise idea of its quality. Naturally, well-known indications of origin have already created the impression on buyers i.e., consumers of that goods. Thus, for example, certain types of products in Serbia have already gained a reputation, or rather the name of the corresponding brand for that product, such as: Serbian plum brandy, Užice prosciutto, Sjenica cheese, Leskovac barbecue, Pirot carpet, vurd (a special milk product) from Babušnica, etc. In the historical part of the development of legal protection of geographical names of products, which was first regulated by law in Yugoslavia in 1981, in legal theory but also in legislation, geographical indication of origin represented a generic term for two of its categories, namely indication of origin and geographical indication, which labelled the products produced in a specific geographical area. Geographical indication of origin represented a collective right of all persons belonging to a specific geographical area, which could be physical or legal. The users who fulfilled the conditions stipulated by the Law were called users of the geographical indication. "In order to acquire the right to a specific geographical indication of origin, it is important that the production or processing of products bearing such a geographical indication is carried out in a specific geographical area. Foreign natural and legal entities could seek protection of a geographical indication of origin with the Federal Office, if this right was recognized in the country of origin and if they fulfilled the conditions stipulated by Yugoslav regulations. Foreign physical and legal entities may, when realising the right to an appellation of origin in Yugoslavia, refer to the provisions of the Lisbon Agreement on the Protection of Indication of Origin and their Registration in 1958, since the Federal Republic of Yugoslavia ratified the Lisbon Agreement in 1998."¹⁹ By ratification of the Lisbon Agreement, our economic entities can, using the benefits provided by that document, acquire the status of an authorized user of an indication of geographical origin in several countries, following a simplified procedure. Legal theory and the new Law on Geographical Indications of Origin²⁰, unlike previous cognizance, although being close, separate the geographical indication into an appellation of origin and a geographical concept of origin. In terms of their content, these two categories are relatively close to the previously regulated geographical indications of origin, i.e. the two categories of appellation of origin and geographical indication. Today, the indications of origin of products are considered to be those indications of geographical origin that are used to mark natural, agricultural, food and industrial products, handicrafts and services. The term appellation of origin refers to the geographical names of countries, regions or localities that label a product originating there, whose quality and special properties are exclusively or essentially adopted by the geographical environment, including natural and human factors, the production, processing and preparation of which as a whole take place in a specific limited area. The term geographical indication is considered to mean an indication that identifies a specific product as originating in the territory of a specific country, region or locality within that territory, where a certain quality, reputation or other characteristics of the product can be essentially attributed to its geographical origin and whose production and/or processing and/or preparation take place in a specific limited area. The subject of protection of geographical origin is the name of a geographical location. This can be a specific mountain, plateau, island, populated area, but exceptionally also an entire country. An example of a country is Cuba for Cuban cigars. An indication that is not a geographical location but which, through long use, has become generally known as a product originating from a specific locality may also be exceptionally protected. This would apply to Feta cheese, etc.

¹⁹ Бесаровић, В.(2000). Интелектуална својина, индустријска својина и ауторско право. Београд. 177.

²⁰ Закон о ознакама географског порекла (Сл.гласник РС, бр. 18/2010 и 44/2018-др.закон).

4. CONDITIONS OF PROTECTION

A geographical indication of origin must not be contrary to Law and morality, must not represent the name of a plant variety or animal species, must not, by its appearance and content, mislead consumers as to the nature and characteristics of the product which are typical for that type of goods. An indication used in the country of origin should include a certain relation between specific qualitative characteristics of the goods and the territory from which they originate²¹. An indication of origin may also protect indications that are not the names of a specific country, region or locality, but which, through long-term use in trade on the basis of the name, have become generally known as the traditional name of a product originating from that area, or is related to the historical name of that area, provided that it fulfils the conditions set out in Articles 3 or 4 of this Law, which define the concept of appellation of origin and the concept of geographical indication. Homonymous names are the names of two or more places where a product originates from, and are identical or nearly identical in written or spoken form, and the protection of such geographical names shall be granted to all interested parties who fulfil the conditions provided for by the Law on the basis of the principles of fair and equal treatment of products on the market and truthful information to consumers, except where this may mislead the public about the exact geographical origin of the product. A product may be exceptionally protected by the protection of an indication of origin if it has a proven traditional characteristic, a high reputation and is well known as a raw material for the production of that product, which originates from a specific, different or wider area of processing, whereby the area of production of the raw material is limited and with special conditions for the production of that raw material, as well as a system of inspection control by which the supervision over the fulfilment of special conditions for the production of raw materials is ensured. The origin of a raw material may be exceptionally protected by an appellation of origin if it has a proven traditional characteristic, a high reputation, and is well known as a raw material for the production of that product that originates from an area different from or wider than the processing area if the area of production of the raw material is limited and there are special conditions for the production of that raw material, as well as an inspection control system that ensures supervision over the fulfilment of the special conditions for the production of raw materials. Which condition must be fulfilled by the origin of the raw material for the production of a certain product, the method and procedure for the inspection control of raw materials for the production of agricultural and food products with a geographical indication of origin shall be prescribed by the minister responsible for agricultural affairs.

A geographical indication cannot protect the name of a product:

- 1) whose publication or use is contrary to public policy or accepted moral principles;
- 2) which represents the name of a protected plant variety or animal species, if it is likely to confuse consumers as to the true origin of the product;
- 3) whose appearance and content are likely to confuse consumers as to the nature, origin, quality, method of production or other characteristics of the product;
- 4) which is identical or substantially similar to a previously registered trademark if, given the reputation, fame and length of use of that trademark, there is a possibility of confusion among consumers as to the production origin of the product;
- 5) which represents the exact name of the country, region or locality from which the product originates, but which provokes the false impression in a consumer that the product originates from other country, region or locality;

²¹ Марковић, С.; Поповић, Д. (2018). Право интелектуалне својине. Београд. 175-177.

- 6) which, due to long-term use, has become a generic or common name for a particular product;
- 7) which is not protected or has ceased to be protected in the country of origin, or which has ceased to be used in that country.

5. REGISTRATION AND RIGHT TO PROTECTION

When determining the right to protection, the competent authority, the Intellectual Property Office of the Republic of Serbia, examines the conditions for establishing a geographical indication of origin and may issue a decision to reject the request for establishing a geographical indication of origin or issue a decision to establish a geographical indication of origin. The registration of a geographical indication of origin is made in the Register of geographical indications of origin and produces legal effect from the date of entry into the Register, not from the date of submission of the application. The geographical indication of origin has no expiration date, but there is an obligation to renew it every three years with prior proof submitted to the Intellectual Property Office of the Republic of Serbia that the prescribed quality control of the product or service has been carried out. Protection of a geographical indication of origin in the first instance is achieved in a procedure conducted by the state administration body responsible for intellectual property affairs, which is the Intellectual Property Office of the Republic of Serbia. Naturally, there are certain procedural costs in accordance with special regulations that determine administrative fees and reimbursements for procedural costs and the providing of information services.

6. SUBJECTS OF PROTECTION

Subjects of protection are the subjective right-holders to a geographical indication and they may be a physical or legal person who produces goods in the locality whose name is protected. In addition to a physical or legal person, the subject of protection may also be an association of such persons, provided that the association fulfils the legal requirements for the association of such persons. At the time of seeking protection of the right to a geographical indication, the producer may be the applicant in the specified locality, who produces the goods for which the protection is sought.

7. CONTENT OF PROTECTION AND SCOPE OF PROTECTION

The right to protect a geographical indication is a subjective right and authorizes the right-holder i.e. the authorized user, to use the indication in commercial transactions and to prohibit others from doing so. Given that, as a rule, there are multiple holders of this subjective right of authorized user for the same geographical indication for the same type of goods, this right is limited by another right-holder. Namely, this authorization cannot limit or affect another authorized right-holder or authorized user. The authorized holder of the right to protect a geographical indication has the authority to prohibit all third parties from using the registered geographical indication or a similar indication for the same type of goods.

8. TERMINATION OF THE RIGHT TO PROTECTION OF A GEOGRAPHICAL INDICATION

Given the separation of the issue of establishing the registration of a geographical indication on the one hand, and the recognition of the status of its authorized users on the other, it is obvious that there is a difference between the termination of the registration of a geographical indication and the termination of the status of an authorized user. The termination of registration of a geographical indication occurs if the appropriate conditions are met, such as:

- 1) Termination of registration in the country of origin, provided that a decision is made terminating the registration;
- 2) Conversion of a registered geographical indication into a generic indication. In order to accomplish this type of termination, it is necessary for the interested party to file a lawsuit for determination and for the court to determine in the procedure by making a final judgment that the registered indication has become generic. Naturally, this implies the entry of the facts of termination of the registered indication of origin into the Register of product indications of origin.

If the registration of a foreign appellation of origin is based on registration in the country of origin, the registration cannot be terminated as long as the registration in that country is ongoing, or if the appellation of origin cannot be converted into a generic indication, i.e. if, according to the regulations in that country, the appellation of origin cannot be terminated for that reason. The termination of the status of an authorized user may be based on the waiver of the authorized user i.e. his/her written statement, by failure to exercise the right after the expiration of some of the three-year periods, by the cessation of existence of the authorized user if there is no legal successor, by revoking the right in the event that the conditions on the basis of which the right was recognized cease to exist, and by the terminating the registration of the geographical indication of origin. Based on the proposal of the interested party, the Intellectual Property Office of the Republic of Serbia shall conduct the procedure for declaring the decision on the recognition of the status of an authorized user null and void. If the procedure determines that the conditions for termination of the status of an authorized user are met, an appropriate decision shall be enacted and entered into the appropriate Register and published officially.

9. PROVISIOINS RELEVANT TO CONSUMER PROTECTION

The basic provisions of consumers protection are provisions of:

- Meeting basic needs - availability of the most necessary goods and services, such as food, clothing, footwear and housing, health care, education and hygiene.
- Safety - protection from goods and services that are dangerous to life, health, property or the environment or goods whose possession or use is prohibited.
- Information - availability of accurate data that is necessary for a reasonable choice of offered goods and services.
- Choice - the possibility of choosing between several goods and services at affordable prices and with appropriate quality.
- Participation - representation of consumer interests in the process of adoption and implementation of the consumer protection policy and the possibility to be represented in the process of adoption and implementation of the consumer protection policy through associations and alliances of consumer protection associations.
- Legal protection - protection of the consumer's rights in the procedure prescribed by law in case of violation of his right and compensation for material and non-material damage caused to him by the trader.
- Education - acquisition of basic knowledge and skills necessary for proper and reliable selection of products and services, as well as knowledge about the basic rights and duties of consumers and the way to exercise them.
- Healthy and sustainable environment - living and working in an environment that is not harmful to the health and well-being of current and future generations, timely and complete information on the state of the environment.

10. CONCLUSION

The right of protection represents a cornerstone of modern legal systems, encompassing both industrial and intellectual property as well as consumer rights. Its proper application and interpretation are essential for ensuring fair treatment and legal certainty for all stakeholders. This includes not only rights holders but also consumers, whose protection has become increasingly significant in contemporary legal discourse. The analysis of various aspects of protection law underscores the need for harmonization of regulations, efficient enforcement mechanisms, and the strengthening of legal frameworks that safeguard consumer interests—particularly in digital markets and cross-border transactions. In light of ongoing challenges such as globalization, digitalization, and the accelerated commercialization of innovation and services, protection law must continually evolve to uphold justice and balance in both the marketplace and society at large.

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IMPLEMENTATION OF EUROPEAN UNION DIRECTIVES IN THE LEGISLATIVE FRAMEWORK OF HIGHER EDUCATION IN THE REPUBLIC OF SERBIA: CHALLENGES AND PERSPECTIVES

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ABSTRACT

This paper explores the process of implementing European Union directives into the legislative framework of higher education in the Republic of Serbia, focusing on the perspectives and challenges that arise along the way. It offers a detailed examination of the degree to which Serbia's legislative framework aligns with EU directives in the context of quality assurance as defined by the Bologna Process. Additionally, the paper investigates how educational reforms more broadly contribute to the wider process of European integration, enhancing the global competitiveness of higher education in Serbia. The study also provides relevant institutions—primarily the Ministry of Education, universities, and the National Entity for Accreditation and Quality Assurance in Higher Education (NEAQA)—with a more comprehensive understanding of this important area of social development in Serbia. The scientific objectives of this research were to describe the process of harmonizing higher education regulations with key provisions of EU directives, and to scientifically identify and explain the legal, institutional, and political obstacles encountered during this process. A broad range of fundamental research and knowledge methods were employed in this study. From the general scientific methods, comparative legal, dogmatic, and statistical methods were applied. Among data collection methods, content analysis was used, specifically the qualitative analysis technique applied to relevant EU directives, educational policies, laws, and by-laws related to higher education. Two key findings emerged from the research. First, the Republic of Serbia has made significant progress in aligning its higher education legislative framework with European Union directives, thereby creating the necessary conditions for higher-quality education and increased international competitiveness of Serbian higher education. Second, the next steps in implementing European standards in Serbia include ensuring quality assurance, advancing dual education, and facilitating the mobility of students and academic staff. The full implementation of EU standards in the field of higher education aims to make Serbian universities competitive within the European and international educational space, promoting student and staff mobility, cultural exchange, and the development of both a shared European and distinct national identity in higher education.

Keywords: *Legal framework of higher education, harmonization of regulations in higher education, quality standards in higher education, mobility of students and academic staff*

1. INTRODUCTION

The integration of the Republic of Serbia into the European educational area is one of the primary imperatives of modern social and economic development. In this context, the implementation of European Union (EU) directives into the legislative framework of higher education is particularly important, as it enables system modernization, quality improvement, and enhanced competitiveness within the global academic community. These changes are not merely administrative—they require a profound transformation of the legal, institutional, and pedagogical systems, thus laying the groundwork for deeper European integration.

Harmonizing Serbia's higher education system with European standards, especially those defined by the Bologna Process, is a complex task involving the continuous revision and adaptation of existing legal and administrative norms. Established legal frameworks often clash with the dynamic demands introduced by new EU directives, resulting in legal uncertainty and inconsistency. This not only affects the quality of education but also limits student and academic staff mobility—two essential indicators of international competitiveness. As such, researching this phenomenon offers valuable insight into mechanisms of adaptation and potential strategies for improving Serbia's higher education system. A deeper analysis reveals multilayered challenges in the practical application of EU directives. Chief among them is the misalignment of existing legislation with evolving European guidelines, leading to fragmented reform implementation. Many laws were drafted during periods that did not anticipate such dynamic changes at the EU level, requiring frequent revisions. Beyond legal issues, institutional and administrative weaknesses—such as poor inter-agency coordination, limited resources, and sluggish decision-making—hinder the effective execution of reforms. Political and societal factors further complicate matters, with traditional structures often resisting necessary change. The objective of this research is to provide a comprehensive overview of the implementation of EU directives in Serbia's higher education system, analyzing how legal, institutional, and political factors influence the realization of these standards. The goal is not only to trace the legislative alignment process but also to evaluate the tangible effects of reforms on the quality, international recognition, and competitiveness of Serbian universities. Employing comparative legal, dogmatic, statistical, and qualitative research methods, the study identifies existing barriers, highlights successful European practices, and proposes practical strategies for improvement. This research is valuable for both the academic community and decision-makers. It explores the key aspects of higher education transformation in an era where the adoption of European standards is increasingly essential. Beyond academic value, the findings may serve as a foundation for improving legal and institutional frameworks—crucial for the continued modernization and internationalization of higher education in Serbia. Harmonizing legal systems is a critical step in the broader EU integration process, and aligning national legislation with EU law is essential for ensuring legal certainty and institutional efficiency. While the importance of this process is undisputed, current research points to significant challenges—particularly in education and in regulatory mechanisms that ensure the effective transposition of EU directives into domestic legislation. In light of these challenges, this paper focuses on analyzing the normative and institutional alignment of Serbia's legal system with EU standards, with particular emphasis on the implementation of legal norms in higher education. Drawing on existing theoretical frameworks and practical issues, the study aims to identify key obstacles and propose recommendations to improve the effectiveness of implementing EU legal standards within the national context.

2. IMPLEMENTATION OF EU DIRECTIVES INTO THE LEGISLATIVE FRAMEWORK OF HIGHER EDUCATION IN THE REPUBLIC OF SERBIA

The implementation of EU directives into the legislative framework of higher education in the Republic of Serbia represents a complex, multi-level process of aligning national legislation with European standards and guidelines. This harmonization requires a thorough revision of existing legal norms and the adoption of new measures aimed at improving the quality of the education system, increasing the transparency of evaluation processes, and strengthening quality assurance mechanisms. A fundamental aspect of this process is the establishment of effective cooperation among state authorities, higher education institutions, and relevant accreditation bodies. The integration of EU directives not only improves the quality of teaching but also strengthens the international competitiveness of Serbian higher education institutions.

It opens up opportunities for greater mobility of students and academic staff, and for integrating research capacities into the global context. By applying European standards through public consultations and systematic evaluations, Serbia aims to define clear criteria and procedures that support the continuous development of academic programs and research initiatives. Amendments to the Law on Higher Education and the introduction of new accreditation standards represent key milestones in building a legislative framework capable of responding to dynamic changes in EU education policy. Further development of the legislative framework depends on the effective implementation of these new measures, accompanied by constant monitoring and evaluation of the changes introduced.

This enables timely adaptation of educational content and methodologies to labor market needs and contemporary trends in research. The synergy between national and European guidelines contributes not only to raising quality standards, but also to strategically positioning the Republic of Serbia within the European and global higher education landscape. The implementation of EU directives in this sector is therefore a strategic process of educational modernization. It not only aligns Serbia with European standards but also opens the way for innovative pedagogical approaches, the advancement of scientific research, and the global integration of the academic community.

2.1. Introduction to the Process of Harmonizing the Educational System

Harmonizing the educational system of the Republic of Serbia with European standards is a key step in the modernization of higher education. This process is driven primarily by aspirations toward European integration, but also by the need to enhance educational quality and increase the global competitiveness of Serbian universities. The implementation of EU directives into the legal framework of higher education aims to standardize quality benchmarks, improve accreditation mechanisms, and ensure mobility for students and academic staff. In Serbia, this harmonization is carried out in accordance with the principles of the Bologna Process, which defines the core parameters for quality assurance, curriculum development, academic program evaluation, and international cooperation. The Ministry of Education, universities, and the National Entity for Accreditation and Quality Assurance in Higher Education (NEAQA) play key roles in ensuring the consistent application of these standards across the Serbian higher education system.

2.2. Legal Framework and Institutional Implementation Mechanisms

To achieve alignment with European educational standards, the Republic of Serbia has enacted a series of legal reforms designed to enhance compatibility with EU directives. Nonetheless, the implementation process demands the ongoing adaptation of the legal framework to guarantee the consistent application of new regulations. The Law on Higher Education is the central legal act governing educational policy in Serbia, designed to align with European standards. It defines criteria for accreditation, ensures quality assurance, outlines funding mechanisms, and regulates the institutional organization of the education sector. NEAQA plays a vital role in maintaining quality standards in higher education institutions by overseeing external evaluations and implementing measures to ensure compliance with EU norms. A comparison with EU legal frameworks shows that Serbian legislation is increasingly reflective of European directives. However, challenges remain, particularly in standardizing evaluation procedures and recognizing qualifications.

2.3. National Education Strategy and Key Objectives

In June 2021, the Serbian government adopted the Strategy for the Development of Education until 2030.¹ This comprehensive strategy covers all levels of education—from ISCED 0 to ISCED 8, including adult learning, teacher training, and other key sectors of the education system. The strategy introduces themes not previously addressed in earlier frameworks. While some specific objectives had already been initiated, they were redefined and integrated into the new strategic vision. The 2030 strategy also aims to align educational policy with developments in science, technology, and modern sectors of society. It seeks to harmonize domestic educational regulations with international frameworks such as those of the UN, EU, and Council of Europe. The document outlines two general objectives: one targeting pre-university education and the other higher education. The first goal emphasizes the improvement of teaching quality, equity, and accessibility at the pre-university level, along with the educational role of all institutions. The second goal is focused on expanding access, enhancing quality and relevance, and ensuring fairness in higher education. The strategy includes a reform plan with specific objectives, measures, and mechanisms to achieve its long-term goals by 2030. As part of its implementation, two new laws have been adopted in the area of higher education: the Law on Student Organizations² and amendments to the Law on Higher Education³.

3. CHALLENGES, OBSTACLES, AND PERSPECTIVES FOR FURTHER DEVELOPMENT

In modern society, the advancement of education—be it technological, social, or economic—is accompanied by numerous challenges that demand systematic analysis and strategic responses. This chapter aims to identify key obstacles, examine the barriers that hinder progress, and explore potential perspectives that, with appropriate interventions, could contribute to sustainable and effective development. The primary challenges are reflected in the increasing complexity of global trends, where technological innovations, digitalization, and automation are reshaping paradigms and require institutions and individuals alike to adapt. The full transition to the digital age necessitates ongoing professional development, the enhancement of educational programs, and systemic educational reform.

Simultaneously, global economic and labor market fluctuations impose new demands on strategic planning, calling for the development of new governance models and innovation systems. The key challenge lies in synchronizing modern technological and methodological advancements with traditional systems, which are often too rigid or resistant to change.

3.1. Legal Challenges in the Harmonization of the Educational System

Legal challenges in aligning the educational system with European standards demand continuous legislative reform and the strengthening of institutional cooperation.⁴

Coordinated and transparent measures are essential to achieving synergy between national regulations and international standards, thereby ensuring sustainable educational development

¹ Government of the Republic of Serbia. (2021). *Strategy for the Development of Education in Serbia until 2030*. Available at: https://www.prosveta.gov.rs/wp-content/uploads/2021/11/1-SROVRS-2030_MASTER_0402_V1.pdf (Accessed: 10 May 2025).

² Law on Student Organizing. (2021). Available at: <https://www.cekos.rs/zakon-o-visokom-obrazovanju-preciscen-tekst-jul-2021-zakon-o-studentskom-organizovanju> (Accessed: 10 May 2025).

³ Republic of Serbia. (2025). *Law on Amendments to the Law on Higher Education of the Republic of Serbia*. Official Gazette of the RS, No. 19/2025 [Consolidated text]. [Online] Available at: <https://www.paragraf.rs/izmene-i-dopune/060325-zakon-o-izmenama-i-dopunama-zakona-o-visokom-obrazovanju.html> (Accessed: 02 April 2025).

⁴ Marinković, Z. (2018). *Legal Challenges in the Implementation of European Educational Standards in Serbia*. *Pravni časopis*, 27(3), pp. 110–135.

aligned with contemporary global trends. Although Serbia has made notable progress in implementing EU education standards, legal inconsistencies remain a barrier to full integration into the European Higher Education Area. Many laws and by-laws are still not fully aligned with current EU directives, creating legal uncertainty and disputes in their interpretation.

3.2. Institutional Obstacles in the Implementation of EU Standards

The implementation of EU directives and standards in Serbia's higher education system—particularly through the Bologna Process—has revealed significant institutional barriers. These obstacles are not merely technical but stem from entrenched administrative structures, fragmented communication between institutions, and fluctuating political priorities.

3.2.1. Inconsistency in the Coordination of Key Institutions

One of the main challenges in implementing EU standards is the lack of consistent coordination among key institutions, including the Ministry of Education, universities, and NEAQA. This fragmentation occurs on several levels. These institutions have different mandates and varying degrees of autonomy, leading to inconsistent prioritization and diverging interpretations of legal norms. Operational inconsistencies affect the implementation and alignment of systems, undermining the uniformity of educational practices.

3.2.2. Different Interpretations of EU Directives

EU directives such as the European Standards and Guidelines for Quality Assurance (ESG) often provide general frameworks, leaving room for multiple interpretations. In Serbia, the absence of a shared understanding of legal terminology leads to different applications of the same standards across institutions, creating legal ambiguities and uneven implementation. While the Ministry of Education serves as the central policy-making body, NEAQA oversees operationalization and quality assurance. However, higher education institutions often exercise significant autonomy, which can result in siloed decision-making and reduced ability to coordinate reforms. The lack of structured communication channels—such as regular meetings, joint working groups, and centralized information systems—further hampers cooperation. This significantly affects the pace and efficiency of reforms, making systemic harmonization with EU standards more difficult.

3.2.3. Administrative Challenges and Limited Capacities

Administrative limitations represent a critical obstacle to reform implementation, visible in several key areas:

- **Shortage of qualified staff:** Institutions often lack personnel with expertise in EU regulations and evaluation methods, weakening their capacity to analyze and apply relevant standards effectively.
- **Outdated procedures:** Many institutions still rely on manual processes, and the absence of digitalized systems slows the implementation and tracking of reforms.
- **Limited financial resources:** Inadequate funding restricts the training of staff, development of infrastructure, and execution of modern evaluation systems. As a result, institutional capacity for continuous monitoring and alignment with EU directives remains low.

Addressing these challenges requires investments in administrative digitalization, continuous staff training, and dedicated financial support for education reform initiatives.

3.2.4. Political Factors and Resistance to Reforms

The political environment in Serbia creates additional obstacles to educational reform, primarily due to institutional instability and inconsistent strategic direction.

- **Fragmentation and short-term planning:** The reform agenda is often driven by political interests, resulting in a lack of continuity and the replacement of long-term strategies with ad hoc measures.
- **Resistance from academia:** Institutions may perceive EU standardization as a threat to autonomy and academic freedom, fostering reluctance to implement reforms.
- **Insufficient funding and long-term support:** Structural limitations—especially in budget planning—impede the implementation of modern reforms. Without stable funding, even well-developed plans remain theoretical.

Overcoming these political challenges requires long-term strategic consensus that transcends individual administrations and includes collaboration among policymakers, institutions, and experts.

4. COMPARATIVE ANALYSIS OF THE IMPLEMENTATION OF EU STANDARDS

This chapter presents a comparative analysis of how European standards are implemented in higher education systems, using case studies from two countries—one an EU member state and the other a candidate country. The aim is to identify and assess institutional, legal, and administrative challenges in the process of integrating EU norms into national legislative frameworks. By comparing different contexts, we gain insight into the factors that facilitate or hinder effective harmonization. This analysis underscores the importance of coordination among key stakeholders and the need to adapt national structures to dynamic European standards. The comparative approach contributes to a constructive assessment of both barriers and opportunities, helping shape more effective strategies for implementing EU directives across diverse institutional environments.

4.1. Case Study: Croatia as an Example of Successful Institutional Integration

Croatia, which joined the European Union in 2013, offers a compelling example of how systematic institutional efforts can improve the implementation of EU standards in higher education. The key elements of Croatia's successful model include:

- **Integrated working groups:** Croatia established multidisciplinary teams that include representatives from the Ministry of Education, NEAQA, and higher education institutions. These groups meet regularly to foster communication and coordination throughout the reform process, reducing fragmentation and improving the consistency of EU directive implementation.
- **Investments in digitalization:** The government recognized the need to modernize administrative procedures and committed significant resources to developing digital platforms for tracking and evaluating educational reforms. This digital infrastructure enables faster data processing and improves institutional communication.
- **Long-term reform strategies:** Croatia adopted long-term strategic plans to integrate EU norms into higher education, which helped minimize disruptions caused by political changes and ensured continuity in the reform process.

Croatia's experience demonstrates that with proactive institutional measures and effective cooperation among all stakeholders, the harmonization of higher education systems with EU norms can be significantly accelerated. Serbia could adopt similar practices, adapting them to its own context to improve institutional capacity and remove obstacles to reform implementation. The Croatian case also highlights that successful implementation depends on integrated coordination, administrative modernization, and political stability. Despite ongoing challenges with institutional fragmentation, limited capacity, and political influence, Croatia's progress suggests that a systematic and strategic approach can yield measurable results.

For Serbia, this means prioritizing institutional cooperation, digital transformation, staff development, and the creation of long-term strategies independent of political cycles. These steps would not only enhance the implementation of EU standards but also contribute to building a more resilient and competitive higher education system. Ongoing research should document best practices, track evolving EU education policies, and develop Serbia-specific models to support comprehensive and effective integration into the European Higher Education Area (EHEA). Croatia's experience stands as a relevant and adaptable model for Serbia's own institutional transformation.⁵

4.2. Case Study: Institutional Integration in Higher Education in Montenegro

Montenegro, as a candidate for EU membership, has in recent years undertaken a number of reforms aimed at aligning its higher education system with European standards. The “Strategy for the Development of Higher Education in Montenegro 2024–2027,” developed by the Ministry of Education, Science, and Innovation, in cooperation with universities and accreditation bodies, outlines measures for improving coordination, modernizing administrative procedures, and defining long-term reform goals.

Key elements of institutional integration in Montenegro include:

- **Legal and administrative reform:** Montenegro's institutional alignment with EU standards involves revising legal frameworks and enhancing coordination among government bodies, regulatory agencies, and quality assurance institutions.
- **Integrated working groups:** Multidisciplinary teams have been formed, bringing together ministry representatives, higher education institutions, and independent experts. These teams facilitate regular communication, resolve legal ambiguities, and promote consistent interpretation and application of EU norms.
- **Digital modernization:** Montenegro has invested heavily in digitalizing administrative processes, allowing for better data management and more transparent reform tracking. This also improves the efficiency of quality assurance and reduces bureaucratic obstacles.
- **Long-term reform strategy:** Strategic documents, such as the 2024–2027 education strategy, define Montenegro's roadmap for harmonizing with EU standards. This long-term planning minimizes the effects of short-term political changes and supports continuous institutional development.

Comparative Lessons for Serbia

Drawing on these regional examples, Serbia's progress and remaining challenges in implementing EU directives can be better understood. The Croatian and Montenegrin experiences highlight the value of:

- **Legal reform and normative alignment:** Serbia has made significant efforts to update its legal framework, including the Law on Higher Education, to bring it closer in line with EU standards and ESG quality assurance guidelines.
- **Institutional development:** Establishing NEAQA has been a critical step in enhancing quality assurance and ensuring the consistent application of EU-aligned evaluation procedures.
- **International cooperation and mobility:** Reforms based on the Bologna Process have improved the compatibility of Serbia's education system with international standards, increasing opportunities for student and staff mobility.

⁵ Eurydice. (2024). *National Reforms in the Area of Higher Education – Croatia*. Available at: <https://eurydice.eacea.ec.europa.eu/hr/national-education-systems/croatia/nacionalne-reforme-u-podrucju-visokog-obrazovanja> (Accessed: 10 May 2025).

- **Regional models of best practice:** Croatia's and Montenegro's strategies—particularly their focus on digitalization, inter-institutional coordination, and long-term planning—offer practical solutions that Serbia could adapt to accelerate its own reform processes.⁶

5. CHALLENGES IN THE IMPLEMENTATION OF EU DIRECTIVES IN THE REPUBLIC OF SERBIA

Despite notable progress in aligning its higher education system with European Union standards, Serbia continues to face several critical challenges that hinder the full and effective implementation of EU directives. These challenges span legal, institutional, administrative, and political dimensions and demand comprehensive, long-term solutions.

Legal Ambiguity and Varying Interpretations of EU Directives

Documents such as the European Standards and Guidelines for Quality Assurance (ESG) provide general frameworks that allow for different interpretations. In Serbia, the absence of a unified understanding of these documents leads to inconsistencies in their application across institutions. As a result, the same standards may be implemented differently depending on the institution, creating legal uncertainty and undermining coherence.

Fragmented Institutional Coordination

One of the main obstacles is the lack of effective coordination among key stakeholders, namely the Ministry of Education, higher education institutions, and NEAQA. Each actor often operates independently, leading to fragmented decision-making, varied interpretations of the law, and inconsistencies in accreditation and evaluation procedures. This lack of unified governance slows down the reform process and weakens overall implementation.

Limited Institutional Capacities

Serbia's institutional infrastructure frequently lacks the capacity to support ongoing reform. The shortage of professionally trained staff, outdated administrative procedures, and inadequate digital systems hinder the modernization of higher education governance. As a result, it is difficult to track reform outcomes or adjust strategies in real time.

- **Human resources** are insufficient, particularly in terms of expertise related to EU educational standards.
- **Administrative processes** are often slow and inefficient, with many tasks still performed manually.
- **Digital systems** for data collection, monitoring, and evaluation are underdeveloped or inconsistently applied.

These factors reduce the system's ability to implement EU standards uniformly and respond flexibly to new challenges.

Shifting Political Priorities and Short-Term Planning

Educational reforms in Serbia are often influenced by short-term political interests rather than guided by stable, long-term strategies. Frequent changes in political leadership and policy direction lead to discontinuity, weakening the momentum of reforms. Additionally, resistance from within the academic community—motivated by concerns over institutional autonomy—can further delay the adoption of standardized EU practices.

⁶ Ministry of Education, Science and Innovation. (2024). *Strategy for the Development of Higher Education in Montenegro 2024–2027*. Available at: <https://www.gov.me/clanak/strategija-visokog-obrazovanja> (Accessed: 04 April 2025).

Insufficient Financial Resources

The effective implementation of EU directives requires sustained investment. However, the education sector in Serbia often faces budget constraints that limit the potential for digital modernization, staff training, and infrastructure development. Without adequate financial support, many reforms remain only partially realized or are implemented inconsistently.

Summary

The challenges Serbia faces in implementing EU directives are multifaceted and interconnected. Addressing them will require:

- A harmonized and binding interpretation of EU standards across institutions.
- Strengthened inter-institutional cooperation.
- Investment in administrative modernization and human capital.
- Political stability and depoliticization of reform processes.
- Consistent and sufficient funding dedicated to higher education reform.

Only through a strategic, coordinated, and well-funded approach can Serbia achieve full integration into the European Higher Education Area and ensure that its reforms yield measurable improvements in quality, transparency, and international competitiveness.

6. CONCLUSION

The reform and harmonization of Serbia's higher education sector with European standards represent a strategic and essential component of the country's broader integration into the European Higher Education Area (EHEA). Although Serbia has made meaningful strides through legislative changes and the establishment of quality assurance mechanisms, persistent challenges continue to hinder the full realization of EU directives. Key issues include inconsistent interpretations of EU regulations, fragmented institutional coordination, and limited administrative and technological capacities. These factors contribute to an uneven application of reforms, weaken accountability, and obstruct the creation of a coherent and transparent higher education system. Political instability and short-term planning further complicate reform implementation. Without stable strategic direction and long-term political commitment, education policies are vulnerable to disruption, slowing the pace of transformation. In addition, limited financial resources remain a substantial barrier to improving infrastructure, training staff, and implementing modern evaluation mechanisms. Despite these challenges, the experiences of neighboring countries such as Croatia and Montenegro demonstrate that significant progress is possible. Their success stories underscore the importance of strategic investment in digitalization, the formation of multidisciplinary working groups, and the development of long-term educational strategies shielded from political fluctuations. For Serbia to fully align with European standards, the following actions are essential:

- Strengthening inter-institutional collaboration and defining clear responsibilities among stakeholders.
- Investing in digital infrastructure to modernize administrative procedures.
- Expanding continuous training programs for staff and experts in quality assurance and EU policy.
- Establishing stable funding mechanisms that support reform implementation and evaluation.
- Depoliticizing education reform to ensure consistency, sustainability, and public trust.

Ultimately, successful integration of EU directives into Serbia's higher education system depends on the coordinated efforts of legal, institutional, and political actors. Continued research, adoption of international best practices, and tailored national strategies will be key to overcoming existing obstacles and securing Serbia's place in a modern, high-quality European educational framework.

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SKILLS FOR THE FUTURE: WHAT WE NEED TO KNOW

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ABSTRACT

The Future of Jobs Report 2025 lists technological change, geoeconomic fragmentation, economic uncertainty, demographic shifts and the green transition as the main trends that will shape and transform the global labor market by 2030. All of these changes, especially advances in technology, in the areas of artificial intelligence, robotics and automation, will affect jobs, opening new ones and reducing demand for some existing jobs. In this way, it will directly or indirectly affect the demand for certain skills. On the other hand, demographic changes which show that we have an aging and declining working-age population in developed countries, while in less developed countries there is a general growth of the population and thus the working-age population, are evident. This means that these countries are likely to be a source of working-age population in the future. However, the question arises with which skills. It is likely that reskilling, upskilling or education will appear as new requirements. Preparing for the future implies understanding and respecting these trends, but also undertaking adequate activities by the country, employers and individuals themselves. In this sense, the question arises as to what skills we will need in the future, and then how to develop them, considering that learning is no longer a one-time activity but a lifelong process. This paper deals with the skills we will need in the future, as well as the activities that will need to be undertaken in order to keep up with all these changes.

Keywords: *Business environment, Skills, Human resources, Global labour market, Demographic shifts, Education, Upskilling, Reskilling*

1. INTRODUCTION

We live in a time of rapid changes, especially technological changes that have affected and are affecting all spheres of business and life in general. If we go back only for fifty years, we will see what it was possible to live without but the world functioned even then. Microsoft Office as a software package for office business was created in 1990. (Microsoft, 2023), previously in the 1980s, DOS was used (Disk Operating System). In 1983, the "modern" Internet was born (McLean, 2024), World Wide Web (WWW) the information retrieval service of the Internet (the worldwide computer network) was invented in 1989 (Cern, 2025). The search engine Google was founded in 1998 (Google, 2025). Mobile phones became available to the public in 1983, but became popular in the 1990s, the first phone with a touch screen appeared in 1992, the first "modern" smartphone in 2006 (Računarski fakultet, 2025), and today we are talking about artificial intelligence, automation, robotics, online business and working from home. The environment is changing rapidly, changes that are taking place are almost impossible to comprehend and see, and yet in that "new" world we have to function, live and do business. In order to succeed, we must have the necessary knowledge and develop adequate skills.

2. TRENDS SHAPING THE BUSINESS ENVIRONMENT AND LABOR MARKET

The basic trends that characterize the modern business environment and labor market can be summarized in several ways. The World Economic Forum in its publication Future of Jobs Report 2025 points out the main trends: Technological change, geoeconomic fragmentation, economic uncertainty, demographic shifts and the green transition. They said that individually and in combination those are the major drivers which will shape and transform the global labour market by 2030 (WEF, 2025). How the labor market will be affected by these trends? Artificial intelligence (AI) and information processing technologies will transform the operations of organizations to the greatest extent and will require new knowledge and new skills from employees. However, while many people fear that artificial intelligence will replace employees and reduce the number of job vacancies, others point out that the essence of its application is to provide support to people, improve human basic skills, empower less specialized employees, or help professionals to work more efficiently. On the other hand, geoeconomic fragmentation, trade restrictions or some protectionist measures affect global economic growth and economic uncertainty, shaping organizations business and shaping the supply and demand for human resources as well. According to McKinsey Global Survey on economic conditions conducted in 2024, geopolitical instability and changes in trade policy are marked as main trends that will affect on global economy (McKinsey, Economic conditions outlook 2024).

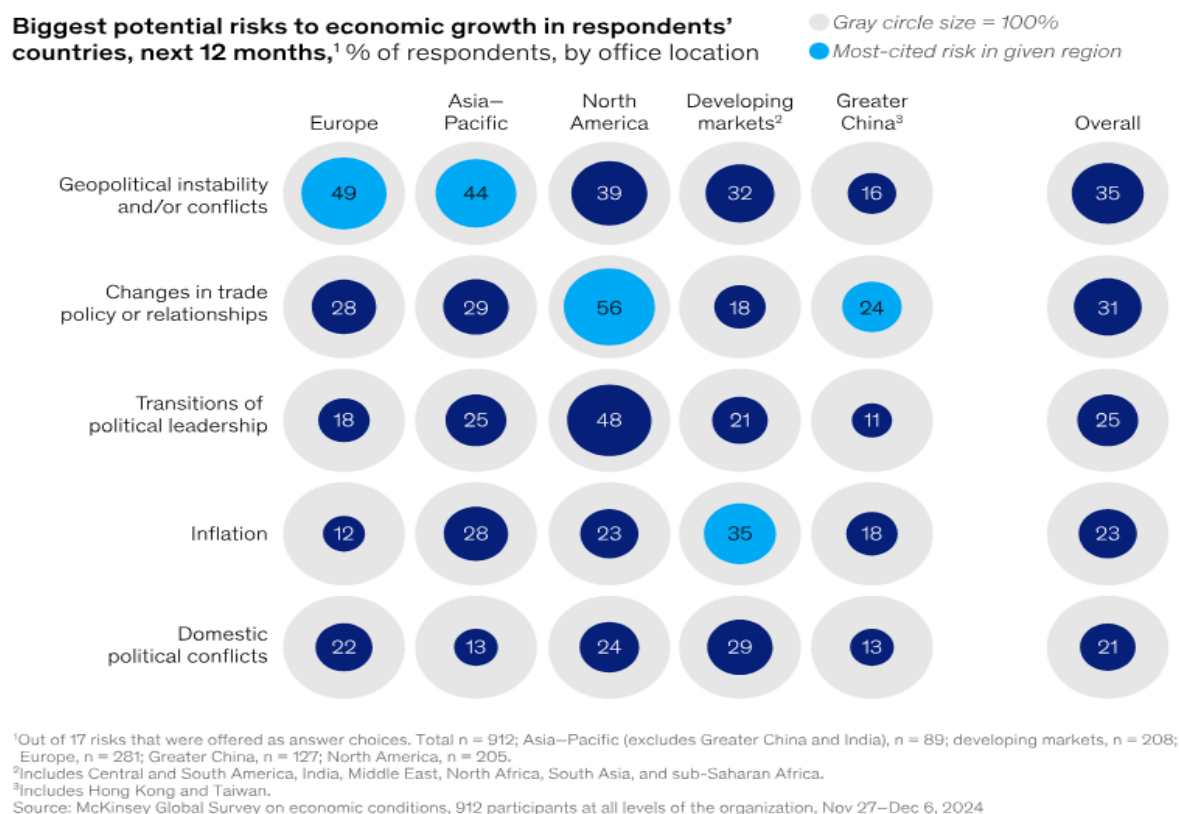


*Figure 1: Biggest potential risks to economic growth in next 12 months
(Source: McKinsey, Economic conditions outlook, 2024)*

Executives in Greater China and North America cited trade policy as the greatest risk to their economies in the coming year while respondents in Asia-Pacific and Europe put at the top of the list geopolitical instability. In addition to economic conditions, another important trend relates to demographic changes.

United Nations, in the article *Shifting demographics*, pointed out: „The world’s population is expected to increase by two billion people, from 7.7 billion at present to 9.7 billion in 2050. Half of global population growth between now and 2050 is expected to come from just nine countries: India, Nigeria, Pakistan, the Democratic Republic of the Congo, Ethiopia, Tanzania, Indonesia, Egypt and the United States of America (in descending order of increase). The population of sub-Saharan Africa is likely to double, while the population of Europe is likely to shrink“ (<https://www.un.org/en/un75/shifting-demographics>). However, in addition to the above, the problem is that the structure of the population is changing, because as they stated „Older persons (ages 65 and above) today comprise the world’s fastest growing age group. Globally, for the first time in 2018, older persons outnumbered children under the age of five, and by 2050, older persons will outnumber adolescents and youth (ages 15 to 24)“. Europe is already facing challenges related to caring for the elderly, which is why the number of healthcare jobs is increasing and ways of getting older people more involved in social life and the economy are being considered, as life expectancy will continue to increase. According to *Future of Jobs Report 2025* global economies and labour markets will be transformed mainly by two demographic shifts: „aging and declining working age populations, predominantly in higher- income economies, and expanding working age populations, predominantly in lower-income economies“ (WEF, 2025). These trends will affect the demand for certain skills and jobs. They said there will be: "an increase in demand for skills in talent management, teaching and mentoring, as well as motivation and self-awareness. An aging population is driving growth in healthcare jobs such as nurses, while a growing working-age population is driving growth in education-related professions such as higher education teachers". American company Velocity Global which deals with global HR solutions highlighted some of main factors that will affect employment. Those are: workplace flexibility and the rise of hybrid models; the gig economy and freelance workforce; focus on diversity, equity, and inclusion (DEI); generational shifts in the workforce; necessity of upskilling and reskilling initiatives; mental health support and well-being in the workplace; flexible workweek models; employer social responsibility (because particularly Millennials and Gen Z, actively seek employment with companies demonstrating strong social consciousness and purpose-driven initiatives). They noticed „Organizations face a dual challenge: addressing current workforce needs while preparing for a future where skills, digital expertise, and adaptability will determine success“ (Velocity Global, 2025 Labor Market Trends).

3. SKILLS NECESSARY FOR THE FUTURE

The skills that will be needed in the future are closely linked to the jobs that will then exist. The question of skills is always linked to the question of the number and type of jobs. The *Future of Jobs Report 2025* estimates by combining respondents’ expectations in job growth and decline with hard data on global employment collected by the ILO (International Labour Organization), that by 2030. macrotrends will influence on creation of 170 million new jobs but this growth is expected to be offset by the displacement of 92 million current jobs resulting in a net growth of 78 million jobs (7% of today’s total employment) by 2030 (WEF, 2025). Figure 2. Global employment change by 2030 shows total number of jobs expected to be created and displaced due to labour-market transformation relative to total employment today. However, in addition to the above, in order to determine the necessary skills in the future, it is important to know what the type of jobs will be, that is, in which areas they will be present and how they will be represented.

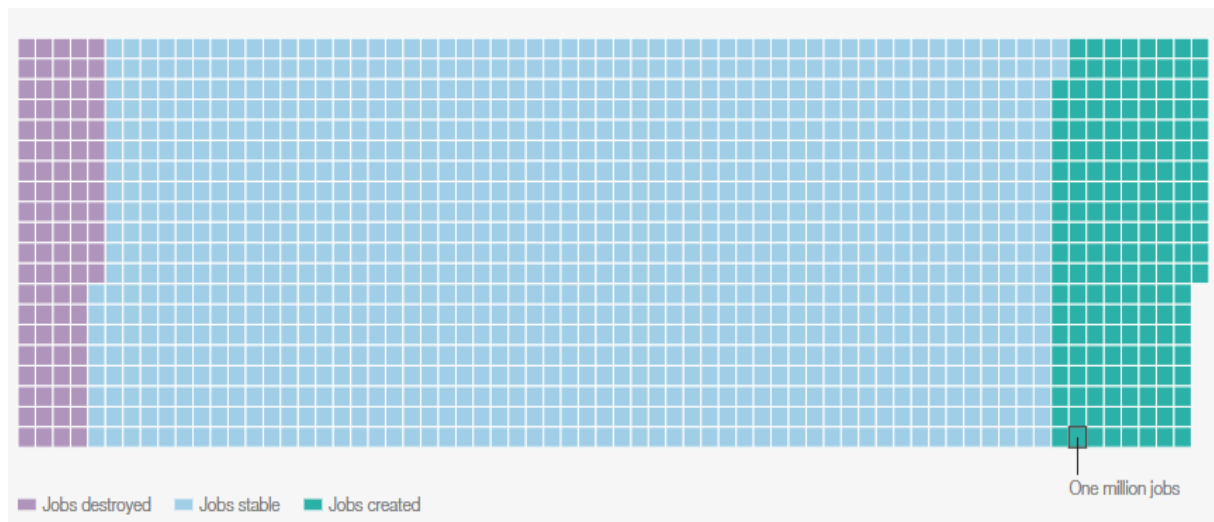


Figure 2: Global employment change by 2030
(Source: WEF, 2025)

„The research predicts that the largest absolute growth will be in jobs related to farm workers, delivery drivers, construction workers, salespersons, and food processing workers. Also seeing significant growth will be jobs in the care economy jobs, such as nurses, social workers, and personal care counselors and aides, along with roles in education, such as secondary and higher education teachers. Clerical and secretarial jobs, are expected to see the largest absolute declines. The fastest growing jobs in percentage terms will be those related to new technologies, including big data specialists, artificial intelligence and machine learning specialists, software and application developers, as well as jobs related to green and renewable energy, including autonomous and electric vehicle specialists, environmental engineers, and renewable energy engineers“ (WEF, 2025). WEF found that “workers can expect that two-fifths (39%) of their existing skill sets will be transformed or become outdated over the 2025-2030 period” (WEF, 2025) and Velocity Global pointed out that „skills-based hiring has emerged as a transformative approach, with 95% of employers considering it the future of recruitment. This shift has proven particularly effective, as organizations focused on skills assessment are 57% more likely to adapt to market changes successfully“(Velocity Global, 2025 Labor Market Trends).

So what skill are important now and how they will change during the time? Research by the McKinsey Global Institute showed that demand for technological, social and emotional, and higher cognitive skills will grow in the future. Actually, in order to define the fundamental skills McKinsey’s started from four broad skill categories: cognitive, digital, interpersonal, and self-leadership. They further identified 13 separate skill groups belonging to those categories and 56 distinct elements of talent that fall within these skills groups. They call them DELTAs (distinct elements of talent) because they are a mix of skills and attitudes. According to them, core skills are those that, regardless of the job performed by the person who possesses them, should enable them: to add value beyond what automated systems and intelligent machines can do, to work in a digital environment, and to constantly adapt to new ways of working and new occupations. Eighteen thousand people from 15 countries completed the online questionnaire and they found „survey participants with a university degree had higher average proficiency scores across 56 distinct elements of talent, suggesting that those with higher levels of education are better prepared for changes in the workplace“ (McKinsey, 2021).

Cognitive		Interpersonal	
Critical thinking ● Structured problem solving ● Logical reasoning ● Understanding biases ● Seeking relevant information	Planning and ways of working ● Work-plan development ● Time management and prioritization ● Agile thinking	Mobilizing systems ● Role modeling ● Win-win negotiations ● Crafting an inspiring vision ● Organizational awareness	Developing relationships ● Empathy ● Inspiring trust ● Humility ● Sociability
Communication ● Storytelling and public speaking ● Asking the right questions ● Synthesizing messages ● Active listening	Mental flexibility ● Creativity and imagination ● Translating knowledge to different contexts ● Adopting a different perspective ● Adaptability ● Ability to learn	Teamwork effectiveness ● Fostering inclusiveness ● Motivating different personalities ● Resolving conflicts ● Collaboration ● Coaching ● Empowering	
Self-leadership		Digital	
Self-awareness and self-management ● Understanding own emotions and triggers ● Self-control and regulation ● Understanding own strengths ● Integrity ● Self-motivation and wellness ● Self-confidence		Digital fluency and citizenship ● Digital literacy ● Digital learning ● Digital collaboration ● Digital ethics	
Entrepreneurship ● Courage and risk-taking ● Driving change and innovation ● Energy, passion, and optimism ● Breaking orthodoxies		Software use and development ● Programming literacy ● Data analysis and statistics ● Computational and algorithmic thinking	
Goals achievement ● Ownership and decisiveness ● Achievement orientation ● Grit and persistence ● Coping with uncertainty ● Self-development		Understanding digital systems ● Data literacy ● Smart systems ● Cybersecurity literacy ● Tech translation and enablement	

Figure 3: Fundamental Distinct Elements of Talent (DELTA) - 56 distinct elements of talent that fall within 13 separate skill groups belonging to four broad skill categories (Source: McKinsey, Defining the skills citizens will need in the future world of work, 2021)

The 5 core skills required by workers today according to Future of Jobs Survey respondents are (WEF, 2024): analytical thinking (with seven out of 10 companies considering it as essential); resilience, flexibility and agility; leadership and social influence; creative thinking; motivation and self-awareness. The next 5 core skills are technological literacy; empathy and active listening; curiosity and lifelong learning; talent management; service orientation and customer service. Cognitive, self-efficacy and interpersonal skills within the top five highlights the importance of an innovative, agile and collaborative workforce, while following five skills related to technology skills, strong interpersonal skills, emotional intelligence and a commitment to continuous learning show how workers must balance hard and soft skills. While the core skill sets are relatively consistent across broader industries and geographical regions, they found a notable distinctions within specific sectors and geographies.

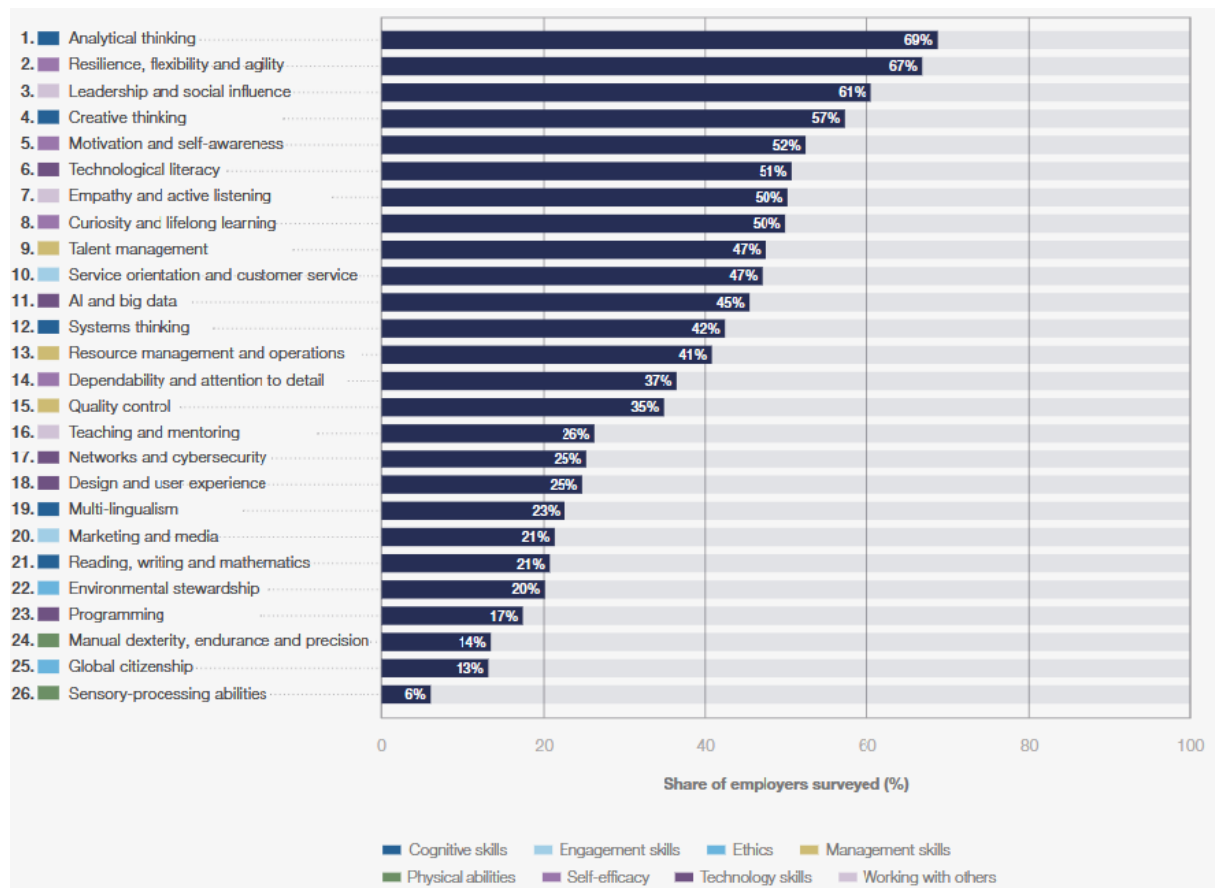


*Figure 4: Core skills in 2025 (with share of employers who consider the stated skills to be core skills for their workforce)
(Source: WEF, 2025)*

In the next five years, there will be changes in those core skills. According to employers expectations, technology skills are predicted to grow in importance faster than any other skill, with artificial intelligence and big data leading the way, followed by networking and cybersecurity and technological literacy. Creative thinking, resilience, flexibility and agility – along with curiosity and lifelong learning – are also seen as increasingly important. The 10 skills on the rise include leadership and social influence, talent management, analytical thinking and environmental stewardship as well. These skills suggest that in the future there will be an increasing need for workers who can lead teams, manage talent and adapt to sustainability and green transitions. The Oxford University Careers Service highlights the importance of eight key employability skills, which are the pillars of the world of work, regardless of sector or job function. According to them, these are: business awareness (understanding what makes an organisation successful, including the importance of innovation and the satisfaction of customers and other key stakeholders), communication (engaging others through listening, observing, writing and presenting), creativity (being curious and innovative), initiative (analysing facts and situations and being proactive in developing new solutions or approaches), leadership (motivating, influencing and leading others), planning (scheduling work, planning resources, managing your own time, multitasking and meeting goals), self-management (accepting personal responsibility, reflecting, receiving feedback and developing yourself) and teamwork (respecting others, collaborating, contributing to discussions and successfully achieving a common goal) (<https://www.careers.ox.ac.uk/article/the-future-of-skills-for-future-jobs>).

Regardless of whether we look at them as a broader concept or a narrower one, various researches generally point to similar skills that we will need in the future, and that it is a combination of soft and hard skills. Skills, knowledge, competences, abilities and attitudes are terms that are often mentioned without clear differentiation, sometimes they are mixed up, however it is important to point out that competences are a broader concept. According to the Guidelines for creating initiatives for the development and adoption of qualification standards of the Qualifications Agency of the Republic of Serbia, competence is an integrated set of knowledge, skills, abilities and attitudes that enable an individual to act effectively in accordance with the qualification standard (<https://azk.gov.rs/>). The Qualifications Agency through its sectoral councils connects the world of education with the world of business, which is why its role in integrating new competences into qualification standards will be very important in the future.

4. HOW TO GET THE NECESSARY SKILLS FOR THE FUTURE

Getting the necessary skills is a joint responsibility of the country (government), organizations and individuals. An effective skills development system requires coordination and cooperation between these actors to ensure that individuals have the opportunity to acquire the relevant knowledge and competencies they need to succeed in their careers and contribute to society.

4.1. The role of country

Each country has a fundamental duty to create the conditions necessary for a strong business climate and workforce development. When it comes to building knowledge and skills, the government:

- Must create a high-quality, inclusive education system across all levels and ensure its sustainable funding.
- It is responsible for aligning education with labor market needs by defining qualification standards. In Serbia, this is handled by Sectoral Councils through the Qualifications Agency. These councils act as expert advisory bodies that determine the demand for qualifications in different sectors. Their responsibilities include analyzing existing qualifications, giving an opinion on the expected outcomes of knowledge and skills in the sector, fostering direct cooperation between industry and education, identifying adult education needs all in line with the Law on the National Qualifications Framework (<https://azk.gov.rs/>).
- It has a role in regulating the quality of educational institutions and training programs. In Serbia, the National Entity for Accreditation and Quality Assurance in Higher Education (NEAQA) accredits programs in the field of higher education, through experts reviews. For adult education, the Qualifications Agency oversees the accreditation of Publicly Recognized Organizers of Adult Education, ensuring quality in non-formal education as mandated by national law. The agency also maintains a sub-register of those recognized providers.

In addition to the above, the country (government) should create policies and programs that support lifelong learning; education and training, especially for vulnerable groups such as the unemployed, persons with disabilities and minorities; and should monitor labor market trends and forecast future skill demands to adjust education policies accordingly. Additionally, in response to demographic shifts, countries must consider strategies to attract and retain workers. „Apart from skills in the fields of artificial intelligence, big data and technological literacy, talent management and resource management are expected to be the most in demand skills in Serbia. Two-thirds of employers identify skills gaps in the labour market as a key barrier for transforming their business“ (WEF, 2025).

4.2. The role of organizations (Private Sector)

Organizations play a vital role in preparing the workforce for future demands by tracking business trends and adapting their strategies accordingly. As workplaces now include five different generations (with Gen Z, the fastest-growing group), businesses must adopt flexible leadership styles that accommodate a range of communication and work preferences. At the heart of these efforts are Human Resources (HR) departments. Their main activities will be:

- To identify necessary skills - skills needed to meet both short- and long-term organizational goals. This involves aligning human resource plans with business plans and forecasting what knowledge, abilities, and experience will be required during specific timeframes (Jovanović Božinov, Kulić, Cvetkovski, 2008, pg.44).
- To invest in training and development for their employees, and promote learning culture - to stay competitive, many companies invest in continuous learning opportunities for employees. This may include in-house training, external courses, mentoring, and job rotation programs. Upskilling and reskilling will be central to HR's efforts. These strategies not only support career growth but also enable internal mobility and adaptability. „Reskilling occurs when employees learn new skills that replace existing ones that are no longer relevant, allowing employees to take on entirely new roles within the company. Upskilling refers to the acquisition of new skills in order for employees to progress within their current career, thereby complementing their existing skill set” (Cvetkovski, Cvetkovska Tomanović, 2024, pg. 242). Employees should be encouraged to regularly update their knowledge and adapt to change as a normal part of career growth.
- To collaborate with schools, universities, and vocational schools - in order to help shape the relevant study programs (especially through the Employers' Council), provide internships, and scholarships for students. “Educational institutions have become one of the most important sources for the recruitment of young people. External sources become important particularly when the quality of available HRs in the labor market is limited” (Cvetkovski, Langović Milićević, Cvetkovska Tomanović, Langović, 2024, pg. 397).

Jaime Augusto Zobel De Ayala, Chairman and CEO of Ayala Corporation said that firms and companies are one of four drivers of country competitiveness. They create national wealth and so their productivity, efficiency, and dynamism is central to country competitiveness (<https://www.competitive.org.ph/node/404>).

4.3. The role of individuals

Individuals play a crucial role in developing skills needed for future success. By staying aware of trends the most relevant to their career paths, they can direct their time and effort toward learning that offers real value in the evolving global job market. Each individual is responsible for their own growth and should take the initiative in identifying the skills they need and actively seek opportunities to acquire them. Individuals should:

- Regularly assess their own performance and actively seek feedback to identify areas where they can improve.
- To remain competitive, they should utilize both formal and informal learning opportunities, as well as networking and learning from others.
- Embrace lifelong learning as a normal option because in today's rapidly changing world of work, continuous learning is no longer optional – it is essential.

In short, individuals who have a proactive approach to learning and adaptability will be in a better position to thrive in the workforce of the future.

5. CONCLUSION

Today it is obvious that the future of organizations will depend on the adoption of new technologies and artificial intelligence in various areas of business. These technologies will be used by employees, which is why they will need to have appropriate knowledge and skills. If an organization wants to remain competitive, it must have employees with the right skills. Labor shortages and skill gaps in the local labor market, talent shortages and the inability to attract the right talent would be the main reasons that will encourage organizations to look for human resources globally. „In the process of recruitment and selection of candidates, apart from knowledge and experience, variables such as gender, age, ethnicity, and religion are significant as well. Depending on these variables candidates will have different knowledge and experience, but also they will have different expectations and desires“ (Cvetkovska Ocokoljić, Babić, 2016, pp. 494). On the other hand, reskilling and upskilling are a way to avoid external recruitment of candidates, but it is necessary to ensure that employees have the skills they need to advance and move to new or improved roles in accordance with their desires and expectations. However, it should be noted that “The most competitive economies combine solid economic performance with efficient and effective public and private sectors, high-quality infrastructure, and human and social capital. These economies also balance productivity and prosperity, meaning they can therefore generate elevated levels of income and quality of life for their citizens while preserving the environment and social cohesion”(IMD World Competitiveness Booklet 2024). The challenge for every nation is to achieve and then maintain competitiveness in the long term. When we talk about the problems that organizations or individuals face today, it is necessary to point out the role of the country. It should provide the prerequisites and create an adequate environment in which organizations and individuals within them or on the labor market will have the opportunity to acquire the necessary skills for the future. We can conclude that acquiring the necessary skills is a shared responsibility of the country, organizations, and individuals. An effective skills development system requires coordination and cooperation between these actors to ensure that individuals have the opportunity to acquire the relevant knowledge and competencies they need to succeed in their careers and contribute to society.

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GENAI FOR NETWORK EXPERIMENTATION: CC OF SC DIVERSITY UNDER THE COMBINED EFFECTS OF RICIAN FADING AND RICIAN CO-CHANNEL INTERFERENCE IN WCN CASE STUDY

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ABSTRACT

This paper analyzes the performance of a selection combining (SC) receiver with L diversity branches in wireless communication networks (WCN), under the influence of Rician fading and co-channel interference (CCI), both modeled using the Rician distribution. Particular focus is placed on the analysis of channel capacity (CC), which serves as a key metric for evaluating the efficiency of information transmission in complex propagation environments. For the considered scenario, a closed-form analytical expression for CC is derived, enabling accurate and computationally efficient performance evaluation without the need for numerical integration. The obtained numerical and graphical results demonstrate how variations in the number of diversity branches L and in the Rician κ parameter, which reflects the ratio between the line-of-sight and scattered signal components, affect system capacity. Moreover, we consider adoption of Generative Artificial Intelligence (GenAI) techniques in order to make network experimentation more convenient and reduce cognitive load, while proof-of-concept implementation is illustrated on the case study based on the system considered in the previous part of the paper.

Keywords: Rician fading, Rician CC, SC receiver, GenAI, Large Language Model (LLM), Vision Language Model (VLM)

1. INTRODUCTION

Wireless Communication Networks (WCN) form the foundation of modern communication systems, enabling the transmission of information without the need for physical infrastructure. Their applications span mobile telephony, sensor networks, satellite systems, and IoT applications. Due to their flexibility and mobility, WCNs play a key role in the development of smart cities, autonomous vehicles, military communications, and industrial automation systems [1], [2]. Operating in wireless environments involves facing challenges such as signal fading, interference from neighboring channels, and dynamic changes in resource availability. Fading can be classified into several models, including Rayleigh fading (environments without a direct line of sight – NLOS), Rician fading (presence of a dominant direct component along with reflections), and Nakagami-m fading (a flexible model of dispersion) [3]. The Rician fading model describes the statistical behavior of a wireless signal in environments where a strong direct (LOS) component exists alongside multiple scattered components. Unlike the Rayleigh model, Rician fading allows for accurate modeling of channels in the presence of a dominant direct path. The key parameter is the κ -factor, which represents the ratio between the power of the direct component and the power of the scattered components. A higher κ -factor indicates greater reliability of the connection. Due to its flexibility, the Rician model is commonly used in the analysis of mobile and satellite systems, as well as in environments with semi-visible direct components [4]. Co-channel interference (CCI) significantly impacts system performance by reducing the effective channel capacity and increasing the error probability. In dense networks where multiple users share the same frequency spectrum, CCI becomes one of the main factors degrading service quality. Efficient receiving techniques, such as spatial filtering and diversity combining, play a key role in mitigating these effects [5]. Diversity techniques are crucial for enhancing system reliability in the presence of fading and interference. The basic idea is to use multiple independent realizations of the same signal to improve performance. Spatial diversity involves the use of multiple physically separated antennas: on the transmitter, receiver, or both. The diversity combining techniques include: SC (Selection Combining), which selects the branch with the highest SNR or SIR. It is simple but does not utilize all the available information; MRC (Maximal Ratio Combining), which uses all branches with weights proportional to the SNR, maximizing the output SNR; and EGC (Equal Gain Combining), which uses all branches with equal weights, along with phase correction. By using diversity, the error probability is significantly reduced, and in the presence of multipath fading and CCI, channel capacity and reliability are increased. In modern systems such as LTE (Long Term Evolution), 5G (Fifth Generation Mobile Networks), and Wi-Fi 6 (IEEE 802.11ax), diversity is implemented through MIMO (Multiple Input Multiple Output) technologies, combining spatial diversity with advanced digital signal processing [6], [7]. This paper analyzes a selection combining (SC) receiver with L input branches, where both the desired signal and co-channel interference (CCI) experience Rician fading. The output corresponds to the maximum signal-to-interference ratio (SIR) across branches. Assuming uncorrelated inputs, the channel capacity is modeled as a first-order statistic. The study evaluates the impact of the Rician κ -factor and number of diversity branches L on system performance, highlighting their role in optimizing Wireless Communication Networks (WCN). The second part of the paper leverages the presented case study for examination of GenAI-driven approach to network experimentation in synergy with model-driven engineering.

2. CC IN SIGNAL AFFECTED BY FADING AND INTERFERENCE

In this paper, we consider the channel capacity (CC) of the signal as a first-order statistic within a WCN system that uses a selection combining (SC) receiver with L diversity branches. The signal is affected by Rician fading, as well as Rician co-channel interference. The SC receiver model under consideration is presented in reference [8].

At the input of the SC receiver, there are n signals denoted as $x_1, x_2, \dots, x_n$ along with n interferences denoted as $y_1, y_2, \dots, y_n$. The SC receiver with L branches (where $L=2, 3, \dots, n$) selects the signal from the antenna that has the highest signal-to-interference ratio (SIR). The probability density function (PDF) of each signal is modeled by the Rician distribution [9]:

$$p_{x_i}(x_i) = 2e^{-\frac{(1+\kappa_d)x_i^2}{\Omega_i} - \kappa_d} \sum_{j_1=0}^{+\infty} \frac{\kappa_d^{j_1} x_i^{2j_1+1}}{j_1! \Gamma(j_1+1)} \left(\frac{1+\kappa_d}{\Omega_i} \right)^{j_1+1} \quad (1)$$

The parameter κ_d represents the ratio of the direct component to the scattered component, known as the Rician factor. The signals are denoted as $x_i \geq 0$ for $i=1, 2, \dots, n$ where Ω_i represents the mean power of the signals. Additionally, $\Gamma(\cdot)$ refers to the Gamma function. In the given channel, the envelopes of co-channel interference follow a Rician distribution:

$$p_{y_i}(y_i) = 2e^{-\frac{(1+\kappa_c)y_i^2}{\gamma_i} - \kappa_c} \sum_{j_2=0}^{+\infty} \frac{\kappa_c^{j_2} y_i^{2j_2+1}}{j_2! \Gamma(j_2+1)} \left(\frac{1+\kappa_c}{\gamma_i} \right)^{j_2+1} \quad (2)$$

where γ_i denotes the mean interference power, and κ_c is the ratio of the direct to the scattered component of the interference signal.

The signal-to-interference ratio (SIR) at the i -th branch of the selection combining (SC) receiver is defined as $z_i = x_i/y_i$, where x_i and y_i denote the envelope of the desired signal and the corresponding co-channel interference, respectively. The output SIR of the SC receiver, which characterizes the overall system performance, is determined by selecting the maximum SIR among all L diversity branches, and is given by: $z = \max(z_1, z_2, \dots, z_L)$.

The probability density function (PDF) characterizes the probability of signal-to-interference ratio (SIR) values at a given branch, providing insights into the statistical behavior of the system in the presence of interference and fading. The PDF is a key tool for evaluating the performance of wireless systems, as it determines the probability of different SIR values that affect communication reliability. The PDF of the SIR z_i at the input of the i -th branch of the SC receiver is defined by the following expression, as stated in [10]:

$$p_{z_i}(z_i) = \int_0^{\infty} dy_i y_i p_{x_i}(z_i y_i) p_{y_i}(y_i) \quad (3)$$

Substituting expressions (1) and (2) into expression (3), we obtain the closed-form expression for the probability density function (PDF) of the random variable z_i :

$$p_{z_i}(z_i) = \frac{2}{e^{\kappa_d + \kappa_c}} \sum_{j_1=0}^{+\infty} \sum_{j_2=0}^{+\infty} \frac{\kappa_d^{j_1} \kappa_c^{j_2} (\gamma_i (1+\kappa_d))^{j_1+1} (\Omega_i (1+\kappa_c))^{j_2+1} \Gamma(j_1+j_2+2) z_i^{2j_1+1}}{j_1! j_2! \Gamma(j_1+1) \Gamma(j_2+1) ((1+\kappa_c)\Omega_i + (1+\kappa_d)\gamma_i z_i^2)^{j_1+j_2+2}} \quad (4)$$

The cumulative distribution function (CDF) of the signal-to-interference ratio (SIR) z_i represents the probability that the SIR at the i -th branch of the SC receiver is less than or equal to a specific value. This function is crucial for evaluating the performance of wireless communication systems, as it enables the analysis of the likelihood that the signal quality meets the necessary threshold for successful communication, considering the effects of interference and fading. By analyzing the CDF of the SIR, one can gain insights into the system's reliability and assess the probability of achieving the desired signal-to-interference ratio under varying channel conditions. The CDF for the SIR can be derived using the expression provided in [10]:

$$F_{z_i}(z_i) = \int_0^{z_i} p_{z_i}(t) dt \quad (5)$$

By substituting the expressions from (3) and (4) into the formula in (5), we derive the cumulative distribution function (CDF). This enables the calculation of the probability that the signal-to-interference ratio (SIR) at the SC receiver input falls below a specific threshold, offering insight into the system's behavior under varying interference conditions:

$$F_{z_i}(z_i) = \frac{1}{e^{\kappa_d + \kappa_c}} \sum_{j_1=0}^{+\infty} \sum_{j_2=0}^{+\infty} \frac{\Gamma(j_1 + j_2 + 2) \kappa_c^{j_2}}{\Gamma(j_1 + 1) \Gamma(j_2 + 1)} \cdot \frac{\kappa_d^{j_1}}{j_1! j_2!} B_{\frac{(1+\kappa_d)\gamma_i z_i^2}{(1+\kappa_c)\Omega_i + (1+\kappa_d)\gamma_i z_i^2}}(j_1 + 1, j_2 + 1) \quad (6)$$

where $B_z(a, b)$ is the incomplete Beta function. The PDF of the signal-to-interference ratio (SIR) at the output of the SC receiver is determined using the formula provided in [11]:

$$p_{z_i}(z) = L p_{z_i}(z_i) \left(F_{z_i}(z_i) \right)^{L-1} \quad (7)$$

By substituting expressions (4) and (6) into the above formula, the probability density function (PDF) of the output signal-to-interference ratio (SIR), denoted as z , is obtained as follows:

$$p_{z_i}(z) = \frac{2L}{e^{\kappa_d + \kappa_c}} \sum_{j_1=0}^{+\infty} \sum_{j_2=0}^{+\infty} \frac{\kappa_d^{j_1} \kappa_c^{j_2} (\gamma_i (1 + \kappa_d))^{j_1+1} (\Omega_i (1 + \kappa_c))^{j_2+1} \Gamma(j_1 + j_2 + 2) z_i^{2j_1+1}}{j_1! j_2! \Gamma(j_1 + 1) \Gamma(j_2 + 1) \left((1 + \kappa_c) \Omega_i + (1 + \kappa_d) \gamma_i z_i^2 \right)^{j_1+j_2+2}} \cdot \left(\frac{1}{e^{\kappa_d + \kappa_c}} \sum_{j_3=0}^{+\infty} \sum_{j_4=0}^{+\infty} \frac{\kappa_d^{j_3} \kappa_c^{j_4} \Gamma(j_3 + j_4 + 2)}{\Gamma(j_3 + 1) \Gamma(j_4 + 1) j_3! j_4!} B_{\frac{(1+\kappa_d)\gamma_i z_i^2}{(1+\kappa_c)\Omega_i + (1+\kappa_d)\gamma_i z_i^2}}(j_3 + 1, j_4 + 1) \right)^{L-1} \quad (8)$$

The incomplete Beta function in the previous expression is represented as [12, 8.391] and [13], and based on this, the probability density function (PDF) of the SIR z is:

$$p_{z_i}(z) = \frac{2L}{e^{\kappa_d + \kappa_c}} \sum_{j_1=0}^{+\infty} \sum_{j_2=0}^{+\infty} \frac{(\gamma_i (1 + \kappa_d))^{j_1+1} (\Omega_i (1 + \kappa_c))^{j_2+1} \kappa_d^{j_1}}{\left((1 + \kappa_c) \Omega_i + (1 + \kappa_d) \gamma_i z_i^2 \right)^{j_1+j_2+2}} \cdot \frac{\kappa_c^{j_2} \Gamma(j_1 + j_2 + 2) z_i^{2j_1+1}}{j_1! j_2! \Gamma(j_1 + 1) \Gamma(j_2 + 1)} \left(\frac{1}{e^{\kappa_d + \kappa_c}} \sum_{j_3=0}^{+\infty} \sum_{j_4=0}^{+\infty} \sum_{j_5=0}^{+\infty} \frac{(j_3 + 1) j_5}{(j_3 + 2) j_5!} \cdot \frac{(-j_4)_{j_5} \kappa_d^{j_3} \kappa_c^{j_4} \Gamma(j_3 + j_4 + 2)}{\Gamma(j_3 + 1) \Gamma(j_4 + 1) j_3! j_4! (j_3 + 1)} \left(\frac{(1 + \kappa_d) \gamma_i z_i^2}{(1 + \kappa_c) \Omega_i + (1 + \kappa_d) \gamma_i z_i^2} \right) \right)^{L-1} \quad (9)$$

In wireless channels with fading, particularly those affected by multipath propagation and co-channel interference (CCI), channel capacity becomes a stochastic variable dependent on instantaneous conditions. The ergodic channel capacity, which represents the average capacity over time, is typically used as a performance metric. This metric reflects the maximum achievable data rate, assuming rapid channel variations and coding across multiple realizations. In the presence of CCI, common in dense networks, it limits the available capacity. Thus, channel capacity is evaluated using the signal-to-interference ratio (SIR), replacing the traditional signal-to-noise ratio (SNR) in capacity calculations. The channel capacity is defined by the following expression [14]:

$$C / B = 1 / \ln(2) \int_0^{+\infty} \ln(1+z) p_{z_i}(z) dz \quad (10)$$

where C is the Shannon capacity, expressed in bits per second (bits/s), representing the maximum data transmission rate that the channel can support with a low probability of error, while B denotes the bandwidth of the channel, expressed in Hertz (Hz), defining the amount of available frequency range for data transmission.

By using expression (9) and the logarithmic function representation from [15]:

$$\ln(1+x) = \sum_{i=0}^{+\infty} (-1)^i \frac{x^{i+1}}{(i+1)!} \quad (11)$$

in expression (10), we obtain the expanded form for the channel capacity:

$$\begin{aligned} C / B = & \frac{2L}{\ln(2) e^{\kappa_d + \kappa_c}} \sum_{j_1=0}^{+\infty} \sum_{j_2=0}^{+\infty} \sum_{j_3=0}^{+\infty} \frac{(-1)^{j_1} \kappa_d^{j_2}}{j_2! j_3! (j_1+1)!} \left(\frac{(1+\kappa_d) \gamma_i}{(1+\kappa_c) \Omega_i} \right)^{j_2+L} \\ & \cdot \frac{\kappa_c^{j_3} \Gamma(j_2+j_3+2)}{\Gamma(j_2+1) \Gamma(j_3+1)} \left(\frac{1}{e^{\kappa_d + \kappa_c}} \sum_{j_4=0}^{+\infty} \sum_{j_5=0}^{+\infty} \sum_{j_6=0}^{+\infty} \frac{(j_4+1)_{j_6} (-j_5)_{j_6}}{(j_4+2)_{j_6} j_4! (j_4+1)!} \right. \\ & \cdot \left. \frac{\kappa_d^{j_4} \kappa_c^{j_5} \Gamma(j_4+j_5+2)}{j_5! j_6! \Gamma(j_4+1) \Gamma(j_5+1)} \right)^{L-1} \int_0^{+\infty} \frac{z_i^{j_1+2j_2+2L}}{\left(1 + \frac{(1+\kappa_d) \gamma_i}{(1+\kappa_c) \Omega_i} z_i^2 \right)^{j_2+j_3+L+1}} dz \end{aligned} \quad (12)$$

By applying the formula from [12; 3.251] to solve the integral in expression (12):

$$\int_0^{\infty} \frac{x^{\mu-1}}{(1+\beta x^p)^v} dx = \frac{1}{p} \beta^{-\frac{\mu}{p}} B\left(\frac{\mu}{p}, v - \frac{\mu}{p}\right) \quad (13)$$

where B is beta function, we obtain the following expression for the channel capacity:

$$\begin{aligned} C / B = & \frac{L}{\ln(2) e^{\kappa_d + \kappa_c}} \sum_{j_1=0}^{+\infty} \sum_{j_2=0}^{+\infty} \sum_{j_3=0}^{+\infty} \frac{(-1)^{j_1} \kappa_d^{j_2}}{j_2! j_3! (j_1+1)!} \left(\frac{1+\kappa_c}{1+\kappa_d} \cdot \frac{\Omega_i}{\gamma_i} \right)^{\frac{j_1+1}{2}} \\ & \cdot \frac{\kappa_c^{j_3} \Gamma(j_2+j_3+2)}{\Gamma(j_2+1) \Gamma(j_3+1)} \left(\frac{1}{e^{\kappa_d + \kappa_c}} \sum_{j_4=0}^{+\infty} \sum_{j_5=0}^{+\infty} \sum_{j_6=0}^{+\infty} \frac{(j_4+1)_{j_6} (-j_5)_{j_6}}{(j_4+2)_{j_6} (j_4+1) j_4! j_5!} \right. \\ & \cdot \left. \frac{\kappa_d^{j_4} \kappa_c^{j_5} \Gamma(j_4+j_5+2)}{j_6! \Gamma(j_4+1) \Gamma(j_5+1)} \right)^{L-1} B\left(\frac{j_1+2j_2+2L+1}{2}, \frac{2j_3-j_1+1}{2}\right) \end{aligned} \quad (14)$$

Figure 1 shows the channel capacity (CC) function from expression (14) at the output of the SC combiner, analyzed as a function of the power ratio between the desired fading signal and co-channel interference (CCI), defined as $w_i = \Omega_i / \gamma_i$, where Ω_i and γ_i represent the average powers of the desired and interfering signals, respectively.

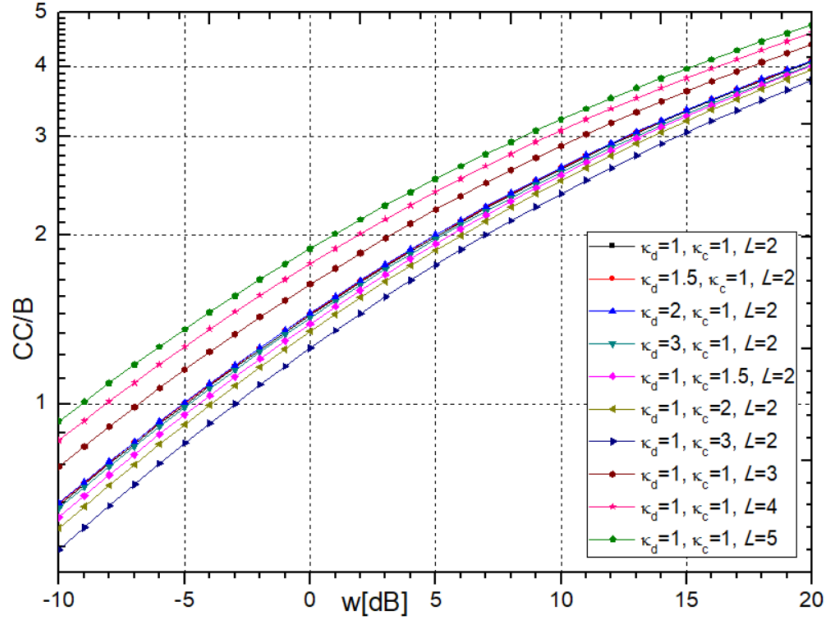


Figure 1: The normalized capacity, C/B , at the SC combiner output when the parameters κ_d , κ_c and L are changing

The analysis of the graph reveals that an increase in the parameter κ_d leads to a slight improvement in channel capacity, indicating that variations in this parameter have a limited impact on the overall system performance. In contrast, an increase in the parameter κ_c results in a reduction of channel capacity, suggesting a degradation in performance due to more severe interference. On the other hand, an increase in the number of diversity branches L has a positive effect on capacity, as its growth significantly enhances the system's performance in terms of data transmission efficiency. In addition to the graphical analysis, this study also presents a detailed numerical evaluation of the convergence behavior of expression (14), which defines the channel capacity, with results shown in tabular form.

Table 1: Number of members for convergence in change of parameters κ_d , κ_c and L

CC/B	$w_i = -10$ dB	$w_i = 0$ dB	$w_i = 10$ dB
$\kappa_d = 1, \kappa_c = 1, L = 2$	9	9	9
$\kappa_d = 1.5, \kappa_c = 1, L = 2$	10	11	10
$\kappa_d = 2, \kappa_c = 1, L = 2$	11	11	12
$\kappa_d = 3, \kappa_c = 1, L = 2$	13	14	14
$\kappa_d = 1, \kappa_c = 1.5, L = 2$	9	10	10
$\kappa_d = 1, \kappa_c = 2, L = 2$	10	11	11
$\kappa_d = 1, \kappa_c = 3, L = 2$	13	14	14
$\kappa_d = 1, \kappa_c = 1, L = 3$	9	9	10
$\kappa_d = 1, \kappa_c = 1, L = 4$	9	9	9
$\kappa_d = 1, \kappa_c = 1, L = 5$	9	9	9

Table 1 displays the number of terms required in the summation of the series in expression (14) to achieve numerical accuracy up to the fifth decimal place. The analysis was conducted under varying values of key system parameters κ_d , κ_c and L , as well as the signal-to-interference ratio (SIR), expressed in decibels (dB). The presented data offer insight into the efficiency of the series approximation under different system configurations and enable a quantitative understanding of the convergence rate of the expression with respect to the wireless channel characteristics. As shown in Table 1, with the increase of parameters κ_d and κ_c , the number of terms required to achieve convergence up to the fifth decimal place increases, indicating slower convergence of the series. In contrast, as the number of branches L increases, the number of terms needed for the same level of accuracy tends to approach a value of approximately 9, regardless of the value of the parameter w_i expressed in dB.

3. GEN AI FOR NETWORK EXPERIMENTATION

In last few years, the constant progress of Generative Artificial Intelligence (GenAI) has enabled numerous novel usage scenarios, as well as refinement of existing ones across many domains, especially Large Language Models (LLMs) and Vision Language Models (VLMs). While LLMs exhibit the capability of understanding language and text, as well as text summarization and generation capabilities, VLMs go step further by taking into account visual inputs (such as camera images or technical diagrams) apart from pure textual inputs for such tasks. Therefore, adoption of such models opens many new horizons when it comes to various aspects in telecommunications as well [16] – from research and development to planning and run-time network management. In this paper, we propose a framework which combines LLMs and VLMs, as well as formally grounded methods based on model-driven engineering in order to make network-related experimentation easier, building upon our previous works [16, 17]. The workflow of the proposed framework is depicted in Fig. 2.

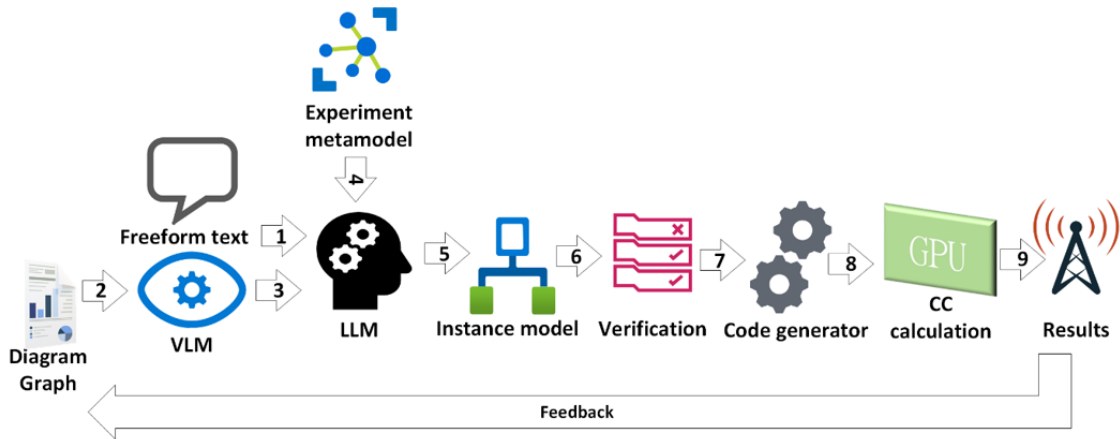


Figure 2: GenAI workflow for network experimentation: 1-User-defined experiment description 2-Performance graphs, system model 3-Textual summary of visual information 4-Ecore metamodel 5-XMI instance model 6-Constraint rules 7-Check pass 8-Experiment setup 9-Performance values.

In the first step, user provides freeform textual description describing the desired experiment. On the other side, visual input can take the form of either a model instance diagram in Unified Modeling Language (UML) notation (as defined by the metamodel in [16]) or performance analysis graphs (similar to Fig. 1). When a UML model instance diagram is used as input, the Visual Language Model (VLM) can extract key aspects of the network experiment and its relevant parameters, such as the receiver, fading environment, and the desired performance metric (e.g., outage probability or channel capacity).

Additionally, comparison of two instance model diagrams using VLMs can be leveraged for update handling scenario, in order to identify changes between two variants. Performance graphs, on the other hand, enable the extraction of insights into performance-related trends, target performance values, and associated parameters. To obtain this information, a series of prompts is executed against the VLM, based on [17]. The information resulting from both textual input and VLM-based summarization is taken into account in the next step which produces instance model corresponding to the described experiment. For that purpose, we also consider network metamodel describing the key concepts of the experiments, together with their properties and relations, as introduced in [16]. For metamodeling we rely on Eclipse Modeling Framework (EMF), Ecore metamodels and XMI-based instance model representation. After that, the previously created instance model is verified against the set of design constraints implemented as Object Constraint Language (OCL) rules. In case that model passes the verification, the flow proceeds with code generation. In this process, we rely transform the previously created model instance using model-to-model transformation in order to parametrize experiment template with relevant values. The target experiment is executed within a GPU-accelerated simulation environment, based on our past work from [18]. With respect to the calculated performance metric (such as CC in our case), user will have feedback about the runtime performance of the network experiment, so additional design corrections can be applied in order to refine the system. When it comes to implementation, for the language model, we selected Llama3-8B-Instruct [19], while OpenGVLab's InternVL2-8BMPO [20] was chosen as the visual language model (VLM). These models were selected for their strong performance in generating acceptable quality outputs, while still being compact enough for local deployment [17]. The deployment environment is based on Google Colab pro version, configured with an A100 GPU. A Python-based web service was also developed to encapsulate the core functionality, utilizing the Quart API. Overview of experiments, underlying prompts and inputs used is given in Table 2.

Table 2: Experiments overview: GenAI for network experimentation

Scenario	Inputs	Prompt	Output
Network experiment update	diagram1: UML image before update	Prompt 1: Identify differences of parameters in [diagram1] and [diagram2].	Updated XMI instance model
	diagram2: UML image after update of κ_d , κ_c and L parameters	Prompt 2: Update [current model] based on [differences]	
Performance trend analysis	graph: CC (as in Fig. 2)	Prompt 1: Update κ_d within [current model] in order to achieve greater CC based on [graph]	Updated XMI instance model – increase κ_d
		Prompt 2: Update L within [current model] in order to achieve lower CC based on [graph]	Updated XMI instance model – decrease L

In the first scenario, our goal is to use VLM to identify changes of fading-related parameters between two visual representations (UML diagrams) and leverage those changes for update of the current experiment model. In the second one, the aim is to update the experiment model parameters of interest in order to achieve either greater or lower CC value as outcome. In both experiments, as OCL constraints, we have incorporated boundary values for parameters κ_d , κ_c and L .

4. CONCLUSION

This paper analyzes the channel capacity of an SC diversity system with L branches under Rician fading and Rician co-channel interference conditions. It is shown that an increase in the fading parameter κ_c leads to a decrease in channel capacity (CC), negatively impacting system performance. Conversely, an increase in parameter κ_d results in improved channel capacity and better system performance. Additionally, increasing the number of diversity branches provides the receiver with more options to select the best quality signal. By introducing a larger number of branches and applying different fading models, SC receivers can significantly enhance signal protection, reduce transmission errors, and increase system stability and capacity. In the second part of the paper, we have also shown proof-of-concept implementation of approach for GenAI-driven network experimentation based on the previously presented case study of CC in Rician fading and co-channel interference environment.

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"EXPO 2027" AND THE POSITIONING OF THE REPUBLIC OF SERBIA IN THE BIPOLAR WORLD

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ABSTRACT

The specialized exhibition "Expo 2027" will be held in Belgrade from May 15 to August 15, 2027. The realization of the exhibition involves the construction of the "Expo 2027" complex. The Government of Serbia announced this exhibition as an exceptional development opportunity that should best position Serbia at the global level. This paper tries to find answers to the questions: Is "Expo 2027" a flywheel that will improve the positioning of Serbia in today's bipolar world, that is, whether in the long term, "Expo" will have a positive impact on the foreign trade operations of the Republic of Serbia. Is "Expo 2027" a key turning point for Serbia, where the final decision will be made on whether Serbia will position itself as an agricultural country or become a mining colony in the future. The research is of an empirical character, it is based on descriptive and deductive methods, on a smaller scale, statistical methods and methods of analysis and synthesis are applied.

Keywords: Serbia, Expo, foreign trade operations, agriculture.

1.INTRODUCTION

The candidacy of the Republic of Serbia to host the World Specialized Exhibition "Expo 2027" was submitted in 2022 by decision of the Serbian Government. Previously, there was no public discussion about the candidacy in the Republic of Serbia. Then, in 2023, Serbia was chosen to host the Specialized Exhibition "Expo 2027", with the theme "Game(s) for Humanity." The exhibition will be held in Belgrade from May 15 to August 15, 2027. It is certain that "Expo 2027" implies dynamic changes for the host country. In 2023, the Law on Special Procedures for the Realization of the International Specialized Exhibition "Expo Belgrade 2027" was adopted in Serbia (Official Gazette of the RS, No. 92/2023), followed by the Regulation on the rules for the procurement of goods, services or works required for the realization of the international specialized exhibition "Expo Belgrade 2027" (Official Gazette of the RS, No. 8/2024). Realization of the exhibition implies capital investments: construction of exhibition facilities - fair space, as well as construction of accommodation facilities for exhibition participants.

A location in the municipality of Surčin was chosen for the construction of the Expo complex, without a public hearing. Previously, it was agricultural land used by the PKB Corporation. Construction of the "Expo" complex on productive agricultural land began in 2024. (Aleksić, 2023, 2024). The Government of Serbia presented the "Expo 2027" project to the Serbian public as an exceptional development project, which aims to achieve the competitiveness of the Republic of Serbia on the global market and the dynamic integration of Serbia into the world economy. However, the citizens of the Republic of Serbia were not given information about how, that is, in what way the Republic of Serbia plans to position itself on the world market through the implementation of the "Expo" project, especially if you take into account the topic "Play for Humanity", which in its title does not contain a single word that would be associated with the sector of economic activity.

2. CONSTRUCTION OF THE "EXPO 2027" COMPLEX - INVESTMENT IN CAPITAL INVESTMENT AND PLANNED BENEFITS

In economics, it is known that control of the rationality of capital engagement and consumption of production elements when performing a specific job is achieved by monitoring the amount, structure, and dynamics of certain types of costs. It is known that "Expo" is an investment complex that is financed with budget funds, that is, public funds, and partly from foreign loans. In the economic sense, the final result of the success of "Expo 2027" will be manifested in the calculation of the total construction costs, that is, the determined cost price of the "Expo" complex and the implementation of the "Expo" exhibition on the one hand, and future short-term and long-term benefits in terms of realized profits on the other hand. Therefore, the analysis of the total financial costs of "Expo 2027" will be determined only when precise information is obtained about the total cost of building the "Expo" complex and the costs of realizing the exhibition, that is, the distribution of that cost to each individual financier, which in this case are the citizens of Serbia. According to the 2022 census, there were 6,647,003 inhabitants in Serbia (Kovačević, 2023, 30). The population of Serbia became the financier of the "Expo 2027" exhibition without a referendum or any other democratic way of decision-making, by the decision made by the Government, i.e., all the inhabitants of Serbia became joint debtors in the loans that the Government realized, or will yet realize due to the needs of "Expo 2027". On February 12, 2025, the daily "Politika" reported that the value of the total costs of construction and organization of "Expo 2027" will amount to 1.29 billion euros. At the end of November 2024, the public debt of Serbia amounted to 38.39 billion euros (Marković, 2025), so it is quite certain that financial contributions to the construction of the "Expo" complex will additionally burden the Serbian budget, that is, all its citizens. The cost calculation of the "Expo" complex should provide a clear picture of the rationality of capital engagement and spending of funds in the process of realizing "Expo 2027", through monitoring the level, structure and dynamics of individual types of costs. For now, the actual costs, as a monetary expression of the funds spent on construction elements, are not information that is available to the citizens of Serbia.

The non-transparency of the financial calculation of the construction of the "Expo" complex, which is financed with public funds, excludes the possibility of management control by the citizens of Serbia through the monitoring of construction activities, and therefore also excludes any possibility of rationalizing those costs. The profitability of "Expo 2027" in the Serbian public is still an unfinished topic. The Serbian Government, as the planner of the "Expo 2027" project, expressed the view that Serbia, as the host of the exhibition, will make short-term profits through the tourism sector (accommodation, food) and the transport sector (transportation). However, it is an open question whether this income will be sufficient to pay the costs of preparation, that is, the construction of the necessary facilities for the realization of the exhibition, and the costs of the realization of the "Expo" exhibition. For the time being, the Serbian government has not made a concrete statement about the long-term revenues that "Expo 2027" should bring to the budget of Serbia, although it has emphasized the positioning of Serbia at the global level as its strategic goal. At this moment, the citizens of Serbia do not have concrete information about what the Government means by the set strategic goal, that is, what "positioning at the global level" specifically means. At the same time, the citizens of Serbia do not have any information about whether the Government wants to position Serbia on one of the two bipolar sides of the world with the realization of "Expo 2027", or whether it wants to position the country so that it balances between "East and West" in a politically undetermined, neutral status.

3. CURRENT POSITION OF THE REPUBLIC OF SERBIA IN THE BIPOLAR WORLD

If the contemporary global international community is viewed through the prism of bipolarity, where on the "eastern" side of the world there are BRIC members, among which the leaders stand out: Brazil, Russia, India and China, and on the "western" side the members of the European Union (EU) and the United States of America (USA), the question arises as to how Serbia is currently positioned in this division of the world. Here it is extremely important to say that Serbia has been a candidate country for EU membership for many years. Regardless of how much that position makes it difficult for it to do business with EU member states due to formal state borders, because there are still restrictions on the flow of people and goods across EU borders, at the same time, that position gives it a certain degree of independence in decision-making, which opens up the possibility of doing business with BRIC members. If the current bipolarity of the global market is viewed from the aspect of the foreign trade exchange of Serbia and both sides of the bipolar world, it can be observed that in the period January - December 2024, the 20 largest foreign trade partners stand out in Serbian foreign trade operations, which make up 79.2% of the total realized foreign trade exchange of Serbia (Stančić, 2025,75). In the turnover of goods and services in 2024, the Republic of Serbia recorded a positive foreign trade balance with 8 EU member countries in the amount of 3.8 billion euros, and a deficit in business with 12 EU member countries in the total amount of 9 billion euros.

State	Deficit/millions of euros	Bipolar division
China	3.374,5	BRIC-s
Italy	1.078,4	EU
Turkey	1.055	Without status
Germany	945,6	EU
Poland	509	EU
Netherlands	429,8	EU
Russia	400,8	BRIC-s
Austria	342,6	EU
Hungary	291,8	EU
Slovenia	285,2	EU
France	272,6	EU
USA	64,2	SAD

*Table 1: Countries with which Serbia had a deficit in foreign trade in 2024
(Source: Stančić, 2025)*

Serbia's largest foreign trade deficit was in business with China in the total amount of 3.4 billion euros. The balance of Serbia's foreign trade exchange in 2024, with a total deficit of 9,490.5 billion euros, and a surplus of 3,840.9 billion euros, shows a negative foreign trade balance. In 2024, Serbia realized a loss in its foreign trade operations in the amount of 5,649.6 billion euros.

Observed from the perspective of the current bipolarization of the world, which has differentiated into two economic and political blocs, the total foreign trade deficit of Serbia with BRIC members in 2024 amounted to 3,775.3 billion euros (37%), while the deficit with EU members amounted to 5,210 billion euros (52%), with the USA 64.2 million euros (1%). In foreign trade exchange with Turkey, a country whose accession to the EU community has not been completed, Serbia realized a deficit in the amount of 1,055 million euros (10%).

State	Surplus/million euros	Bipolar division
Croatia	54.3	EU
Czech Republic	183.8	EU
Slovakia	250.1	EU
Bulgaria	267.8	EU
Romania	434.2	EU
North Macedonia	504.3	EU
Bosnia and Herzegovina	979.1	Without status
Montenegro	1167.3	EU

*Table 2: Countries with which Serbia achieved a surplus in foreign trade in 2024
(Source: Stančić, 2025)*

Serbia did not achieve a surplus in foreign trade with any BRIC member, but achieved a positive balance in foreign trade exclusively with EU members and the country in the status of a candidate for EU membership - the Federation of Bosnia and Herzegovina. The most important foreign trade partners of Serbia in 2024 are: China, which is a member of the BRICS, EU member states, and countries with the status of candidates for admission to the EU.

Export		Import	
State	in millions of euros	State	in millions of euros
Germany	4166.1	China	5128.9
Bosnia and Herzegovina	1941	Germany	5111.7
China	1754.4	Italy	2772.4
Italy	4694	Turkey	2077.2
Romania	1385.3	Hungary	1661.4
Total	13940.8	Total	16751.6

*Table 3: The most important foreign trade partners of Serbia in 2024.
(Source: Stančić, 2025)*

Among the most important foreign trade partners of Serbia in 2024, the EU members dominate, where Germany is recognized as the most important foreign trade partner, although a deficit of 945.6 million euros was realized in the foreign trade exchange with it. As a BRIC member, China achieved a profit of 3,375.5 billion euros in foreign trade with Serbia. Data from the foreign trade statistics of Serbia are not encouraging. They show that Serbia operated irrationally in 2024, that it imported more than it exported, that is, that it made a loss in foreign trade operations. A similar picture of foreign trade business was in 2023. The most important foreign trade partners of Serbia were EU member countries with 59.7% of participation in the total foreign trade exchange of Serbia in the period January-December 2023. This year, participation in the list of the most important foreign trade partners of Serbia is occupied by two BRIC members: China and Russia.

Export		Import	
State	in millions of euros	State	in millions of euros
Germany	4315.3	Germany	4821.1
Bosnia and Herzegovina	1967.1	China	4502.2
Italy	1771.6	Italy	2683.2
Hungary	1562.4	Turkey	1731.2
Rumunija	1444.6	Russia	1598.4
Total	11061	Total	15336.1

*Table 4: The most important foreign trade partners of the Republic of Serbia in 2023.
(Source: Stančić, 2024)*

In the period January-December 2023, the final balance of foreign trade operations with Serbia's most important partners shows a negative balance, i.e. a loss of 4,275 billion euros. Whether this negative trend in foreign trade business from 2023 and 2024 will change depends on the future economic policy and strategic planning of future economic activities of Serbia. First of all, it is necessary to establish clear frameworks on which goods and services and in what quantity to import or export. It is clear that in order to reduce the foreign trade deficit, Serbia should limit the import of foreign goods and services, and increase the export of its own goods and services.

However, the differentiation of the international market, which is controlled by both sides of the bipolar world, does not leave many opportunities for underdeveloped or poorly developed national economies to market their goods freely on the global market. The strategy of exporting goods or services from underdeveloped or underdeveloped economies to international markets requires not only a wise national economic policy, but also the necessary skills and knowledge in the segment of economic diplomacy, so that goods and services find their way to international markets. Therefore, it is clear that "Expo 2027" gives Serbia the opportunity to present its potential to the international community during the exhibition. This raises the question: what are Serbia's potentials?

4. PROBLEMS AND OPPORTUNITIES OF SERBIA IN THE ROLE OF HOST COUNTRY "EXPO 2027"

As already mentioned, the Serbian Government emphasized that the benefit from the "Expo 2027" organization is expected in the transport, tourism and hospitality sectors. If we start from the fact that "Expo 2027" is of a global character and that exhibitors are expected from all over the world, Belgrade Airport "Nikola Tesla" is a strategically important airport for the implementation of the "Expo 2027" project. However, we should not forget that in March 2018, the Government of Serbia and the French company "VINCI Airports" signed an agreement on a twenty-five-year concession of the Airport "Nikola Tesla" (Belgrade Airport), so that the profit that will be realized thanks to the traffic of passengers and goods during the holding of "Expo 2027" belongs to the concessionaire.

For the needs of the future "Expo" complex, a branch of the railway line from Zemun Polje, via the Belgrade Airport to the "Expo" location is being built, the main contractor is "Power China", a company owned by the Chinese state (021.rs). For the future line, trains have been ordered from China, their delivery is expected in 2026 (Beobild). In the road traffic segment, China has been building high-speed roads and highways in Serbia over the past years. (021.rs). Their construction was financed with budget funds and loans, so that this capital investment is paid off jointly by all citizens of Serbia. For this reason, we should not expect that the "Expo" will bring profit to Serbia, since it is clear that the transport sector will bring profit to France (EU) and China (BRIK).

According to the data of the Republic Institute of Statistics, Serbia was visited by foreign tourists from around 50 different countries in the period January-December 2024. The largest number of overnight stays (80.9%) were made by tourists from EU countries, but the two individual countries whose tourists made the most overnight stays are Russia with (622.4 thousand) and China (404 thousand), both members of BRICS. A similar picture was recorded during 2023 and 2022.

State	2022.	2023.	2024.	Total 2022-2024.
Russia	594194	665819	622381	1882394
Turkey	442591	521288	603787	1567666
Ostale vanevropske zemlje	348516			348516
Bosnia and Herzegovina	342730	351542	375306	1069578
Germany	242481	282252	292685	817418
North Macedonia	213481	260329	276802	750612
Montenegro	207589		261567	469156
China (including Hong Kong)		282069	404047	686116
Romania		254387		254387

Table 5: The number of overnight stays by foreign tourists in the Republic of Serbia during 2022-2024. (Source: Stančić, 2025)

By May 25, 2025, 86 countries have confirmed participation in "Expo 2027" (Expo 2027). This data, for now, absolutely means that in the tourist statistics of Serbia for the year 2027, visitors from 86 different countries will be recorded, which is 58.13% more compared to the statistics of visits by foreign tourists from the year 2024.

The list of countries participating in "Expo 2027" is not closed, by the time the list is finally closed, it is expected that there will be around 160 countries. In addition, the organizers of "Expo 2027" announced to the Serbian public that between 2.6 million and 4 million people will visit Belgrade during the "Expo" (Vreme). It is clear that the success of the Belgrade Exhibition depends on the number of visitors who should increase their spending in the Serbian capital during the period of "Expo 2027", and why the quantity is important can be graphically presented using a simple calculation. If it is assumed by a simple calculation that from the opening of the exhibition on May 15, 2027, until its closing on August 15, 2027, that is, in a time interval of 92 days, from the 86 countries registered so far, 10 people will come to Serbia and stay there as exhibitors, this means that on a daily basis (minimum) 860 foreigners will stay in Serbia.

When the assumed, minimalistic estimated number of exhibitors who will stay in Serbia each day is multiplied by the duration of the "Expo" exhibition, the conclusion is reached that Serbia will achieve a total of 79,120 overnight stays by foreign exhibitors. If, from the perspective of people's primary needs, 3 daily meals are taken as a standard (breakfast, lunch, dinner), the conclusion is reached that during the duration of the "Expo" exhibition in Serbia, foreign exhibitors will consume a total of 237,360 meals. If it is assumed that at least one daily meal will contain meat, and the amount of 300 grams (gr) is taken as the standard for the portion, this would mean that 285,000 kilograms (kg) of meat will be needed per day, which is a total of 23,736,000 kg of meat, i.e. 23,736 tons (t) of meat for the 92 days of the exhibition. Or, if it is assumed that 2 million people, including exhibitors and tourists, will visit Serbia during the "Expo" exhibition, and that the consumption of meat per person is 300 gr, this means that Serbia, as the host country, will need an additional 1,800,000 t of meat. In the period from 2014 to 2022, an irrational economic policy led to the collapse of domestic livestock production. According to the data of the Republic Institute of Statistics, the import of meat to Serbia from 2014 to 2022 recorded a dynamic growth.

The financial value of imported meat in 2014 was 94.7 million euros, and in 2022 the value of meat imports was 253.4 million euros (Gradinac, 2024). According to data published by Branislav Gulan in June 2024, 496,000 tons of all types of meat are produced in Serbia annually. If we take as a starting point the previously assumed fact that during the Expo in Serbia there will be an extreme increase in meat consumption, i.e. that an additional 1,800,000 t of meat will be needed during the Expo, it can be concluded that Serbia needs to increase its current livestock production 5 times in order to be able to meet the needs of its own market and the expected increased consumption during the Expo. The Republic Institute of Statistics announced that according to the 2023 Census of Agriculture, 508,325 agricultural holdings were registered in Serbia. Of these, 61.7% of farms raise livestock, with the most common herd size: 3-9 head of cattle, 1-2 head of pigs, 3-9 head of sheep. Cattle and sheep are mostly raised in the Šumadija Region and Western Serbia, while pigs and poultry are raised in the Vojvodina Region. From this segmentation, it is clearly observed that each of the mentioned Regions within the framework of their livestock production, due to the increased need for meat during the implementation of "Expo 2027", can increase their livestock production fivefold. However, this raises the question of free placement of domestic products on the domestic market. It is clear that there was an excessive import of meat and meat industry products in Serbia, which destroyed domestic production in previous years. Is this negative trend a consequence of economic dilettantism, the interests of certain structures that have found personal benefit in import trade, or is it a matter of preparing the market for the implementation of a new product - artificial meat? In Serbia, as in the countries of the Region, there is no legal regulation regarding artificial meat, but since 2024, rumors have been spreading among the Serbian public that a plant for the production of artificial meat (Kilibarda) has been opened in Surčin, not far from the location where the "Expo" complex is being built, at an existing foreign-owned factory. Whether some future perspective of meat production is the reason why livestock farming has been systematically destroyed in Serbia, for now, remains an open question. Seen from today's perspective, the recovery of livestock production in Serbia and the placement of domestic products on the international market has the potential to directly contribute to stopping the multi-year negative trend in Serbia's foreign trade operations. But, for this purpose, the previous disastrous economic policy must be changed, and certain measures must be adopted. The model for the recovery of livestock production can be found in the economic history of Serbia, as an example from the 60s of the 20th century, when the cooperative farming model reached its maximum in the agricultural sector, with the aim of organizing and massifying production and safely placing goods on the market (Aleksić 2024a). Therefore, "Expo 2027" could be a flywheel that would revive the previously systematically destroyed cooperatives, which in modern conditions, according to the system of the entrepreneurial model of organization, could lead to the recovery of agricultural production in Serbia. The revitalization of cooperatives in order to increase livestock production in Serbia could, in the short term, meet Serbia's primary needs for meat, and then, during the realization of the "Expo 2027" exhibition, domestic production could meet the increased needs for this food. From a long-term perspective, the recovery of livestock production and the placement of domestic products on the international market has the potential to directly contribute to stopping the multi-year negative trend in Serbia's foreign trade operations. The problem of placing domestic agricultural goods and ready-made food products on foreign markets could be solved with the help of well-designed marketing and economic diplomacy during the "Expo" exhibition, where all participating countries should be recognized as a potential market for the export of Serbian agricultural products. However, the current economic policy of Serbia obviously does not depend on sound economic theories and legality, nor, as it turned out, on the will of the citizens of Serbia. In July 2024, the EU and Serbia signed a Memorandum of Understanding to establish a strategic partnership focused on sustainable raw materials.

This partnership, in accordance with the goals of the EU's green transition, aims to strengthen mining in Serbia, with a special emphasis on lithium mining (Nenadović, 2024). Even though during 2023 and 2024, the citizens of Serbia repeatedly, during mass protests, expressed the position that they do not want Serbia to turn into a mining colony, and representatives of the scientific public of Serbia published an original scientific paper "Impact of investigative activities of a potential lithium mine on the environment in western Serbia" in a renowned world scientific magazine from the "Nature" group, in which they presented arguments why it is not permissible to mine in Mačva from the idea of lithium mining certain circles in the Republic of Serbia and the EU do not give up. At the global level, we are contemporaries of the race of developed EU member countries, the USA and BRIC members for ores and minerals in economically undeveloped and developing countries, which, unfortunately, includes Serbia. The colonial economy and the exploitation of mineral wealth in poor countries should enable a "green" energy transition for countries with high development. "It is known that this topic, on a global scale, is a field of conflicts and a critical issue of environmental justice" (Beta). How unenviable the position of the Republic of Serbia is today is evidenced by the fact that not only the EU is reaching for the mineral resources of the Republic of Serbia. Currently, China, a member of BRICS, is mining with its three companies in Serbia (Nenadović, 2025). Therefore, the "East and the West", i.e., both the EU members and the BRIC members, are equally competing for Serbia's mineral wealth, although the citizens of Serbia have repeatedly stated that they do not want Serbia to become a mining colony. Serbian agro-economists have calculated that mining on the fertile Mačva agricultural land would bring Serbia an income of 17.4 million euros per year, which is about 2.6 euros per inhabitant of Serbia. On the other hand, the current, generally collapsed agricultural production brings an income of 600 million euros, which far exceeds the projected earnings from mining (Tufegčić).

5. CONCLUSION

The "Expo 2027" exhibition is a financially and operationally demanding project that, as an investment financed by public funds, will lead to additional debt for all citizens of Serbia. Therefore, it is particularly important that the costs during the preparation of the "Expo 2027" exhibition must be strictly controlled, in order to remain within the framework of real, economic values of construction materials and construction works that appear as the costs of building the "Expo" complex. Financial control implies constant monitoring of expenses, and since it is a matter of public funds, it is quite justified that the public of Serbia participates in the control. Realization of the exhibition itself in the period from May 15 to August 15, 2027, in the short term, could bring income and thus pay off part of the invested funds in the construction of the "Expo" complex and the organization of the event itself. Income can be expected, but under the condition that only local food and agricultural products are offered to visitors during the exhibition. In the long term, with well-implemented marketing and economic diplomacy, along with honest and experienced negotiators, Serbia could conclude new trade agreements, especially in the segment of export of agricultural products and products of the food industry. This model could be one (perhaps the only) way for Serbia to finally reach a surplus in its foreign trade exchange, which would inevitably affect the gross national income, that is, the standard of all citizens of Serbia. Therefore, "Expo 2027" could be the key that will solve the question of whether Serbia, according to the majority will of its citizens, will remain an agricultural country, or, according to the interests of both world blocs, will be turned into a mining colony. Therefore, "Expo 2027" for Serbia is not only an important geo-economic project, but it is also a geo-political project that can decisively influence the future of Serbia. Therefore, Serbia must use its role as host of "Expo 2027" wisely in order to protect its national interests.

The fact that significantly larger amounts of food will be needed during the implementation of the exhibition, already now, in 2025, must be recognized as a development opportunity for the Serbian agricultural and food sector. Food producers would have to organize and put pressure on the government to stop the excessive import of agricultural and food products into Serbia. At the same time, farmers, organized according to the cooperative association system, should already now develop a strategy to maximize agricultural production, make a strategic plan with the food industry and enter the global market with sufficient quantities of food that will first be marketed to the visitors of "Expo 2027".

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ETHICAL LEADERSHIP IN SPORTS MANAGEMENT

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ABSTRACT

There is rising concern that athletes' moral and ethical character is not being developed in the contemporary sports culture. Leaders should be considered as the primary source for moral guidance for followers, however, most research focuses on the coach, when it comes to ethical leadership. Little empirical research has been conducted to examine athletes' perception regarding the ethical leadership style of sports management and the potential influences it may have on their moral behavior and performance. The aim of this paper is to define ethical leadership and draw attention to the importance of this concept in intercollegiate sport. Furthermore, it highlights potential gaps in the existing literature where further research is needed to better understand the influence of ethical leadership in sports context from global economics perspective as well. By comparing cases from Hungary, Greece, the USA, and Indonesia, it aims to reveal how economic development influences ethical leadership's effectiveness and its role in cultivating athletes' moral and ethical character.

Keywords: *ethical leadership, sports management, intercollegiate sport*

1. INTRODUCTION

Leaders serve as a central source of ethical guidance when it comes to employees. There is a rising question about the influence of the ethical behavior of the leaders and how it contributes and shapes the behavior of the followers. (Colvin, 2003; Revell, 2003). Most subordinates seek moral guidance from an outside source, such as their significant others, or superiors, rather than themselves (Treviño, 1986), therefore the leaders around them have an important role when it comes to guidance. Furthermore, research has demonstrated that moral leaders have a favorable impact on both the moral environment of an organization and the moral conduct and thought patterns of their followers (Victor & Cullen, 1988). This information implies that the ethical behaviors the leaders engage in and the moral environment they create can have an important influence on subordinates. In addition to that, research has demonstrated that ethical leadership and ethical climate can promote ethical behaviors and thoughts (Ho & Lin, 2016; Mayer, Kuenzi & Greenbaum, 2010). Most discussion and research on this topic center on education and work settings, yet little has been discovered in the field of sports, especially focusing on the sports management and not the coach.

And this is highly important, since individuals in supervisory positions are influenced to engage in similar leadership styles as their higher level leaders (Mayer, Kuenzi, Greenbaum, Bardes, & Salvador, 2009). Moreover, lower-level supervisors receive ethical leadership from higher-level leaders, and these supervisors then use ethical leadership to positively impact their subordinates (Mayer et al., 2009). In order to better understand the meaning of ethical leadership and its influences from the sports management perspective, we propose to study this topic from a descriptive viewpoint. To begin with, explaining the concept of ethics is crucial. Fundamentally, ethics is the study that explains whether an individual's behaviors are morally right or wrong, and their actions are seen as good or bad (Morgan, Meier, & Schneider, 2001). Negative social behaviors, such as cheating and purposely hurting an opponent are frequently seen in sports (Kavussanu, Seal & Philips, 2006). For this reason is important to question why athletes engage in these unethical actions. I. D. Boardley and M. Kavussanu (2007) suggests that "players are often evaluated based on the outcomes of their actions rather than the means through which they achieve them" (p. 609). This implies that the environment and the leaders, hence the sport management, may have the ability to influence these behaviors by evaluating, and providing feedback to the athletes after these actions were performed. Therefore, the values the superiors set for their followers are highly important, since they need to contain not only success criterias, such as performing well during games, competitions and winning, but also sportmanship, fairplay and tolerance (Lee, Whitehead & Balchin, 2000). In connection with this concept, and in order to better understand the effects of ethical leadership, it is essential to understand how the moral growth of an individual develops. The theory of cognitive moral development offers a thorough explanation to this phenomena (Kohlberg, 1981; Kohlberg, 1984). According to Kohlberg's theory, individuals morally reason at one of the six stages. Stage one is associated with understanding what is considered right and wrong, by receiving reward or punishment after engaging in certain behaviors. Stage two includes performing a certain action in order to follow social norms. Stage three refers to making decisions based on fulfilling the demand of socially significant groups, such as classmates, teammates or family. At stage four, individuals' behavior is driven by obligation to follow rules and respect authority. Stage five is associated with ethical reasoning based on considering other members' well-being in the society. Finally, at stage 6 decision making is motivated by equality and respects for other. Kohlberg's moral development theory is highly significant in connection with ethical leadership, since it highlights the strong influence of the environment on individuals and their ethical decision-making processes (Kohlberg, 1981, 1984). For this particular reason, this topic needs to be further investigated, including sports settings as well.

2. ETHICAL LEADERSHIP

Ethical leadership is critical in a variety of contexts, including business and sports, because leaders have the ability to favorably and negatively affect the moral behavior of their organization's members (Langvardt, 2012; Mendonca, 2001). Research has shown that subordinates' ethical thinking and conduct can be highly influenced by ethical leadership (Victor & Cullen, 1988; Lu & Lin, 2013). Also, Shamir (2007) describes subordinates as individuals who are highly influenced by leaders. Before explaining ethical leadership in the context of sports management, we first outline the most widely accepted concept of ethical leadership: "the demonstration of normatively appropriate conduct through personal actions and interpersonal relationships, and the promotion of such conduct to followers through two-way communication, reinforcement, and decision-making" (Brown, Treviño, & Harrison, 2005, p.120). This definition implies that ethical leaders display behaviors such as fairness, honesty and integrity to be credible role models, that refers to the "normatively appropriate conduct through personal actions and interpersonal relationships..." part of the concept.

The word "normative" also suggests that cultural differences may appear when it comes to this topic. Brown et al. (2005) based their findings on social learning theory, arguing that "leaders influence the ethical conduct of followers via modeling . . . by virtue of their assigned role, their status and success in the organization, and their power to affect the behavior and outcomes of others" (p. 119). The definition of ethical leadership is grounded in two theories. One is the social learning theory (Bandura, 1986) and the other is the social exchange theory (Blau, 1964). Bandura's social learning theory serves as the foundation for ethical leadership since it emphasizes watching and modeling reactions, behaviors, and attitudes (1986). Modeling refers to several psychological matching processes, such as observation, imitation, and identification. According to Bandura followers model the actions of their superiors and engage in similar behaviors and attitudes. More precisely, people with position, power, attractiveness, and credibility draw attention as role models for others to emulate (1986). Therefore, if leaders engage in moral behaviors and make decisions based on ethical guidelines, their subordinates will follow their example and engage in similar actions. Furthermore, individuals with higher competence and status have a stronger influence on subordinates (Bandura, 1986). Therefore sport managements are in outstanding position of influencing morally appropriate behaviors from their athletes. Leaders also have the ability to encourage their followers to follow moral guidelines, by rewarding ethical behaviors and administering punishment after engagement in unethical ones (Brown, Treviño, & Harrison, 2005; Treviño, Brown, & Hartman, 2003). According to Bandura, the reward and punishment provided by the leader has a significant influence on the behavior of the followers (1991). The reason for this is that a certain behavior can have both positive and negative consequences that can elicit emotions, such as pride or regret. These emotions determine how likely it is that the individual will engage in similar actions in the future. Moreover, they are also more like to continuously engage in those behaviors that resulted in a positive outcome or reaction. In connection to this theory, Bandura et al. also explained the cognitive theory of moral disengagement, that individuals practice cognitive control over their feelings and behavior, based on their internal and external moral norms about they are expected to behave (1996). However, in order to effectively impact followers' moral decision-making and conduct, leaders must show credibility by modeling behaviors like fairness, honesty and good communication (Brown & Trevino; Sims, 1994). On the other hand, despite of influencing morally appropriate behaviors, the social learning theory also implies that by administering reward and punishment along with modeling, leaders also have the ability to create an unethical environment and encourage unethical behaviors of their followers (Brown & Mitchell, 2010; Sims, 1994). The other theory that serves as the foundation for ethical leadership is social exchange theory (Blau, 1964). This theory provides an insight into the influence leaders have on subordinates. The theory focuses on reciprocity and explains that when someone acts in a way that benefits the other person, that individual may feel pressured and obligated to return the favor (Blau 1964). This exchange is either transactional, including material things, or socioemotional, such as respect and trust (Blau, 1964; Miles, 2012). According to these findings, if leaders engage in ethical leadership and set moral standards, followers are encouraged to behave similarly, however the same can be observed with negative behaviors. Brown et al. (2005) also created a construct and an instrument, called ethical leadership scale, that measures subordinates perception of ethical leadership. Additional study has indicated that ethical leadership is especially significant in fostering positive and decreasing harmful behaviors in organizations (Mayer et al., 2009). Moore et al. (2018) further strengthens this idea, because they found a negative relationship between ethical leadership and moral disengagement. According to Brown et al. (2005), leaders, who engage in ethical behaviors generate more trust in the followers towards them, therefore they will be more likely to model their superiors' behavior and engage in similar actions.

Furthermore, Bedi et al. (2016) found that those who follow ethical leaders experience stronger organizational commitment, higher engagement, stronger job satisfaction and perform better in their jobs. Bedi et al. (2016) also discovered, that because of ethical leadership, subordinates put effort into their job, are more likely to report workplace problems and conflicts and experienced lower levels of stress at work. One reason for this might be that leaders occupy positions of power and status that can affect employees' thoughts and conduct, therefore they can act as moral role models for their followers (Brown et al., 2005; Sims, 1994). An important issue to address is that there is a rising number of unethical-organizational behaviors both in local and foreign companies (Trevino, Nieuwenboer & Kish-Gephart, 2014). Unethical-organizational behaviors refers to the unethical actions of the subordinates that is beneficial for the organization (Umphress et al., 2010). These behaviors are not based on self-interest, rather on altruistic reasons, followers chose to engage in these behaviors with the aim of making the function of the organization more effective (Umphress and Bingham, 2011). In connection with the importance of leadership styles in the organization, research also suggests that the moral disengagement of an individual can be influenced by environmental aspects (Petitta et al., 2017). Pressure and demand from the environment of an individual can trigger the internal self-regulation processes to deactivate, resulting in behaviors that violate ethical guidelines (Bandura, 1991; Moore, 2008).

3. ETHICAL LEADERSHIP IN SPORTS MANAGEMENT

Unethical behavior is still a persisting problem in sports (Rader, 2004; Malloy & Zakus, 1995). Sport context and physical activity provide opportunity for individuals to engage in prosocial and antisocial behaviors, such as assisting an injured opponent or cheating during a competition or game (Kavussanu, 2008). In sports, ethical behavior can be defined as 'a low frequency of engagement in negative social behaviors or unfair play' (Chow, Murray, and Feltz 2009, 425–26). Research suggests that moral leadership of sports coaches has a positive impact on athletes' moral behavior and increased team loyalty (Constandt, De Waegeneer, and Willem 2018). Furthermore, athletes are more likely to model the behaviors of coaches who exhibit moral leadership (Bolter and Weiss 2013). However, Constandt and Willem (2019) discovered, that the coach's engagement of moral leadership is mediated by the club's ethical culture. To further support this idea, some studies imply that moral leadership styles of the superiors have a favorable impact on athletes' ethical behavior and it results in higher devotion to the team (Constandt, De Waegeneer & Willem, 2018). Moreover, Coaches, who demonstrate ethical leadership, are more likely to be modelled by their athletes (Bolter and Weiss 2013), however, it is the moral climate of the management and organization that mediates the coach (Constandt & William, 2019). Unethical behaviors and the mentality to 'win at all cost' has been becoming more and more popular in sports. Current instances include academic dishonesty in collegiate sports (Tracy, 2017), and the inaction of the leaders to act on sexual assault in American Gymnastics (Vagianos, 2018). Referees in European non-professional soccer are also faced increased verbal and physical abuse from players (Krug, 2013) and this sport is further questioned by the increasing recorded cases of racism (Conn, 2015). The use of performance-enhancing substances remains an ethical dilemma in North American collegiate sporting cultures as well (Yusko, Buckman, White, & Pandina, 2008). One explanation to this phenomena could be that in some cases sport managers do not consider keeping ethical guidelines as their primary focus, rather they prioritize other aspects of the sport, such as money and victory (Rudd, & Mondello, 2008). According to Rudd and Mondello (2008), this may give an explanation why research suggests that ethical decision-making in sports management does not have a high value, since in the United States there are only a few available programs in sports management that require an ethics course. Despite the limited focus ethics receives in sport management, moral decision-making is a crucial part of being a manager or a leader.

They are responsible for making moral decisions that may have a high influence on the well-being and safety of their community members and subordinates, since they have to face several moral dilemmas in their work (Trevino, 1986; Lumpkin, Stoll, & Beller, 2012). Ethical leaders set high standards for ethical behavior and discipline followers who fail to follow these norms (Trevino, Hartman & Brown, 2000). They serve as role models for ethical behavior and are perceived as trustworthy and fair. Coaches that demonstrate ethical leadership behaviors will be more likely to be followed and emulated by their athletes (Bolter&Weiss, 2013). For this particular reason, it is outstandingly important for sports managers to acquire the right skills to be able to make morally acceptable decisions.

4. MORAL MANAGER

Moral management is a key characteristic of an ethical leader, according to Treviño and colleagues (2003). Moral managers: make ethics an explicit part of their leadership agenda by communicating an ethics and values message, by visibly and intentionally role modeling ethical behavior, and by using the reward system (rewards and discipline) to hold followers accountable for ethical conduct (Brown & Treviño, 2006, p. 597). Furthermore, individuals in positions of power are responsible for ensuring a safe and ethical environment (Mostafa, Farley, & Zaharie, 2020). For this particular reason, sports management must be clear in communicating the message of ethics and values of the team, in order to act as a moral manager in sports (Roby, 2014). Furthermore, moral managers model ethical guidelines to their followers and effectively communicate their values to their organization (Trevino, Hartman, & Brown, 2000) and live by ethical guidelines in all parts of their lives (Roby, 2014). Moreover, reward and punishment are other tools used by moral managers to set clear expectations for what considered as moral and immoral behavior (Trevino et al., 2000). The same findings are true in sports context. By acting as moral role models, sports directors can encourage their associate and assistant directors to follow moral standards as well (Roby, 2014). In addition, members of the athletic department will engage in similar ethical leadership styles as their associate and assistant athletic directors (Mayer et al., 2009). To sum everything up that has been stated above, moral managers and ethical leaders establish ethical values, such as trustworthiness and honesty to their organization, clearly communicate these values and model these behaviors through their actions and their decision-making processes (Brown, et al., 2005; Trevino et al., 2000). Furthermore, moral managers also administer punishment and reward to their followers and subordinates, in order to set ethical guidelines (Brown, et al., 2005; Trevino et al., 2000).

6. CONCLUSION

Although several researches are concerned with ethical leadership, the topic still needs further investigation (Ciulla, 1998). The rising number of unethical behaviors in sports have elevated the question of more ethical behavior in sports management (Kartakoullis, 2009). One commonly used tool for handling these ethical issues in organizations is to establish a code of ethics (Webley & Werner, 2008). The writing of this paper was motivated by the need to examine and further increase ethical leadership in sports managements (Burton & Peachey, 2014). As described previously, ethical leadership is important in several contexts. However, in intercollegiate sport, there is a need for further research, this area has not been completely examined yet by scholars, even if some of them have already raised concern for exploration of ethical leadership in sports context (Lumpkin & Doty, 2014; Roby, 2014). To sum everything up that has been stated above, ethical leadership can be highly influential to shape the moral behavior of the followers and create an ethical environment for them (Brown & Mitchell, 2010; Sims, 1994). However, this paper highlights that intercollegiate sports have not been completely examined in connection with ethical leadership in the management, and there is still room for future research and development in this area.

Future Research directions

The paper indicates that there is an opportunity to address a gap in the literature connected to sports management and ethical leadership. Further empirical studies are needed to be conducted, in order to investigate the influences of ethical leadership in the sports management on athletes' behavior. We highlight some interesting directions of academic research below that scholars may wish to explore in the future, connected to ethical leadership. Although, we don't imply that these suggestions are the only directions of ethical leadership research, however further findings on this topic could significantly contribute to sport management and intercollegiate sports. First of all, it would be important to examine how ethical leadership of the sports management is perceived by athletes, since there is little existing empirical research on this area. Scholars could investigate these perceptions and compare them across sports, divisions, cultures and genders. Furthermore, moral behaviors of the sports management could be examined in connection with other domains in sports, such as athletes' moral disengagement and their subjective athletic performance, in order to get a deeper insight to how to transform sports for the better and how to increase athletes' performance. Future studies could look into the obstacles and difficulties leaders in sports management have to face, when it comes to moral leadership and influencing athletes' behaviors and how to overcome these barriers. Moreover, since a previous study has demonstrated that demographic variables can determine the extent to which individuals engage in unethical behavior (Umphress et al., 2010), the differences between divisions, genders and cultures could be highlighted as well in the future. Last but not least, scholars could further measure the effects of ethical leadership of the sports management, and research the extent to which these effects are mediated by the coach.

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BASICS OF INTERNATIONAL LAW AND LEGAL CHALLENGES IN THE CONTEMPORARY MULTIPOLAR WORLD

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ABSTRACT

This paper provides a comprehensive overview of the fundamental postulates of international public law and analyses the complex challenges it faces in the contemporary multipolar world. Starting with the definition and basic principles, the paper explores the main sources of international law, such as treaties and customs, and analyses in detail the transition from bipolar to multipolar world order and the profound implications and changes to international relations and law. Particular emphasis was placed on the in-depth analysis of the main actors of the multipolar world, including China, Russia, the European Union, India and Brazil, and their specific legal and political strategies. The paper explores the role of international law in the protection of human rights and analyses in detail the challenges of respecting legal norms in the context of contemporary conflicts and crises, with particular reference to the examples of Ukraine and the Western Balkans as case studies. The role of international organizations in crisis management, theoretical aspects of international law in a multipolar context, fragmentation into geo-legal systems are also considered, and the assessment of the resilience and relevance of the international legal order in a fragmented geopolitical environment is concluded.

Keywords: *international law, multipolar world, human rights, crisis management, international security, Ukraine, Western Balkans, geopolitics, international organisations, fragmentation, geo-legal order*

1. INTRODUCTION: DEFINITION AND BASIC PRINCIPLES OF INTERNATIONAL LAW

International public law is, in essence, a system of legal rules governing relations between subjects of international law. Traditionally, these entities were primarily sovereign States, but modern international law increasingly recognises other actors, such as intergovernmental organisations (e.g. the United Nations), and in certain domains, such as human rights and international criminal law, individuals.

1.1. Specificities of the international legal order

What makes international law unique and fundamentally different from internal (national) law is its decentralised and horizontal structure. Unlike the legal system within the State, there is no such thing as:

- A central global legislator (such as the Global Parliament) who would make laws binding on all. Rules are created primarily by the consent of the States themselves, through contracts and customs.
- The central executive authority (such as the world government or the police) with a monopoly on the legitimate use of force.
- Mandatory judiciary with automatic jurisdiction for all disputes. International courts, such as the International Court of Justice (ICJ), shall have jurisdiction only if the disputing States agree to their jurisdiction.

Precisely because of this decentralisation, international law largely depends on voluntary respect by States, the principle of reciprocity and their common interest in maintaining stable and predictable international relations.

1.2. Fundamental principles of international law

The modern international order is based on a number of fundamental principles codified primarily in the Charter of the United Nations (1945), in particular in Article 2 thereof. These principles constitute the constitutional core of the international community and include:

- Principle of sovereign equality of States: All States, regardless of their size, military power or economic strength, are legally equal.
- Principle of non-threat or use of force: States must refrain from threat or use of force against territorial integrity or political independence of any State.
- The principle of peaceful dispute settlement: States are obliged to settle their disputes peacefully.
- Principle of non-intervention in home affairs: No State has the right to intervene in the home affairs of any other State.
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2. MAIN SOURCES OF INTERNATIONAL LAW

2.1. Main sources

Sources of international law are defined in Article 38. The Statute of the International Court of Justice and shall be divided into main and ancillary. International treaties (conventions): formal agreements concluded between States (or other entities) in writing, governing their mutual relations. They are a fundamental source of law as they constitute a direct expression of the consent of the States. The Vienna Convention on the Law of Treaties (1969) codifies the rules on the conclusion, application and interpretation of contracts, including principles such as pacta sunt servanda (contracts must be respected) and *bus sic stantibus* (change of circumstances). Customary international law: rules resulting from the general and consistent practice of States, accepted as law (*opinio juris*). For a rule to become customary, it requires long-standing practice and the conviction of States that such conduct is legally binding. Examples include the principle of diplomatic immunity, the prohibition of torture and the right to self-defence. General principles of law recognised by civilised peoples: These are fundamental legal principles common to most national legal systems, such as the principles of good faith, proportionality, the prohibition of abuse of rights and *res judicata*.

2.2. Auxiliary sources

Judicial decisions of international courts and arbitration tribunals and the teachings of the most invited experts (doctrine) are used as supporting sources. These sources do not create a right, but help to interpret and apply it. The case law of the International Court of Justice, the European Court of human Rights and other international courts plays a key role in the development and refinement of international standards.

3. DEEP HISTORICAL ANALYSIS: COLD WAR AND EVOLUTION OF INTERNATIONAL LAW

3.1. Bipolar world and legal institutions (1945-1991)

The cold War (1945-1991) was a period of intense political, military and ideological conflict between the two dominant global blocs led by the United States and the Soviet Union. This era of bipolar division of the world has shaped international relations and legal institutions, but has also imposed certain restrictions on the functioning of international law.

3.1.1. The Cuban crisis (1962) as a paradigm case

The October 1962 Cuban missile crisis is a paradigmatic example of how geopolitical tensions can bring international right to the brink of collapse. The crisis arose when the Soviet Union began installing nuclear missiles in Cuba, which the United States considered an unacceptable threat to its national security. From a legal point of view, the crisis raised several key issues: the right to self-defence (the USA claimed to be entitled to preventive self-defence under Article 51. The UN Charter), the maritime blockade (the American “quarantine” of Cuba represented a de facto maritime blockade, which is an act of war under international law), and sovereignty (the Soviet right to deploy missiles in Cuba, with the consent of the Cuban government, was in line with the principle of sovereignty). The crisis has been resolved through diplomatic channels, but it has shown that in the bipolar world, legal norms can be subordinate to geopolitical imperatives. It is important to point out that both superpowers avoided directly invoking international law, favouring bilateral negotiations outside the UN (Krivokapic, 2022).

3.1.2. Proxy wars and legal consequences

During the cold War, proxy wars became common because the United States and the Soviet Union avoided direct military conflict because of the threat of nuclear war. These conflicts - in Korea (1950-1953), Vietnam (1955-1975), Afghanistan (1979-1989), Angola, Nicaragua and other countries - had profound legal consequences. Erosion of the principle of non-interference: both superpowers have regularly violated the principle of non-interference in the internal affairs of other countries, justifying their actions with ideological imperatives. Instrument of international law: legal standards were used selectively to justify their actions and condemn opponents. Weakening of the UN: the Security Council was often paralyzed by veto rights, limiting the possibilities for collective action.

3.1.3. Influence over the UN and veto rights

Bipolarism had a particularly destructive effect on the functioning of the United Nations. Between 1946 and 1991, veto rights were used more than 200 times, with the Soviet Union using veto 120 times and the United States 69 times. This practice has led to the paralysis of the Security Council, the development of alternative mechanisms such as the United for Peace resolution (1950), and the regionalisation of security through the emergence of military alliances such as NATO (1949) and the Warsaw Pact (1955).

3.2. Transition to the Unipolar World (1991-2008)

After the fall of the Berlin Wall and the collapse of the Soviet Union, a short period of American domination followed (unipolar), marked by an increase in liberal internationalism and humanitarian interventions (Golubovic Reiser, 2023). This period was characterised by the expansion of international institutions, the expansion of NATO and the EU, and attempts to establish a “new world order” based on Western values. However, this unipolar moment was short. As early as the early 2000s, signs of resistance to us domination began to appear, especially after the invasion of Iraq (2003) without UN approval.

4. MULTIPOLAR WORLD: THOROUGH REPRESENTATION AND ANALYSIS OF ACTORS

4.1. Definition and characteristics of the multipolar world

The multipolar world signifies a global order in which there are multiple centers of power shaping international relations. Unlike the bipolar world of the cold War, where the United States and the Soviet Union dominated, China, Russia, the European Union, India, Brazil and other regional leaders play a significant role in the multipolar world.

This complex dynamic increases challenges in establishing and maintaining universal legal norms, as conflicting interests and competition between forces intensify.

4.2. United States: Hegemonic adjustment

Legal strategy: the US seeks to maintain its dominance through a combination of multilateral institutions (they control) and unilateral actions when multilateralism does not serve their interests. American “exceptionality” manifests itself through selective respect for international law. Key instruments: Control over international financial institutions (IMF, World Bank), dominance in NATO and other security alliances, use of economic sanctions as an external policy instrument, refusal to ratify key treaties (Rome Statute, UNCLOS).

4.3. China: a revisionist force with a constructive approach

Legal strategy: China promotes a “constructive revision” of the existing order - it does not want to completely topple it, but to reform it according to its interests. The Chinese approach is characterised by an emphasis on sovereignty, non-interference and gradual development. Key instruments: The Belt and Road Initiative (BRI) as an alternative to Western development models, the Asia Bank for Infrastructure Investments (AIIB) as a competitor to the World Bank, the promotion of a “community with a shared future for humanity”, emphasis on economic and social rights over civil and political rights.

4.4. Russian Federation: revisionist opposition

Legal strategy: Russia actively promotes the concept of multipolarity as a counterbalance to Western domination (Boban, 2023), using energy resources, military power and diplomatic influence to challenge the existing order. Key instruments: Promotion of “traditional values” as an alternative to liberal norms, use of veto rights in the Security Council to block Western initiatives, energy diplomacy as a geopolitical instrument, support for authoritarian regimes as a counterbalance to democratic values.

4.5. European Union: a normative force in crisis

Legal strategy: the EU is a unique subnational creation that seeks to promote multilateralism and the rule of law, even though it faces internal challenges. Key instruments: Promoting “effective multilateralism”, making EU accession conditional on respect for the rule of law, the European Convention on Human Rights as a model for other regions, soft power through trade, assistance and diplomacy.

4.6. India: an unprecedented rising force

Legal strategy: India seeks to maintain strategic autonomy, avoiding strong alliances and maintaining flexibility in international relations. Key instruments: BRICS membership and Global South interest promotion G20, Look East policy to strengthen ties with Asia, emphasis on the reform of the UN and other international institutions.

4.7. Brazil: Global South Regional leader

Legal strategy: Brazil positions itself as the voice of Global South, advocating reform of international institutions and greater representation of developing countries. Key instruments: leadership in BRICS and G20, promotion of “responsible sovereignty” in the Amazon, peaceful dispute resolution in Latin America.

4.8. Impact on the adoption of international law

In the multipolar world, the process of adopting international law becomes more complex due to fragmentation of consensus (different forces have different priorities and values), competitive institutions (the emergence of alternative organisations such as BRICS, SCO, EAEU), selective application (States choose which standards they will respect depending on their interests), and regionalisation (strengthening regional legal systems at the expense of the universal ones).

5. DETAILED CHALLENGES AND CASE STUDIES

5.1. Ukraine: a complex legal analysis

5.1.1. Legal justifications for the Russian aggression

The Russian invasion of Ukraine in 2022 constitutes a flagrant violation of the fundamental principles of the UN Charter, notably the ban on the use of force and respect for territorial integrity. Russia has offered several legal justifications: self-defence under Article 51. The UN Charter (however, there is no evidence of an armed attack by Ukraine against Russia), a collective self-defence with the “people's Republics” of Donetsk and Lugansk (not internationally recognised), and the protection of Russian citizens (international law does not permit the use of force for the protection of nationals abroad).

5.1.2. Instrument of humanitarian intervention

Russia also attempted to instrumentalize the concept of humanitarian intervention, claiming to protect the Ukrainian population from the alleged “genocide”. This misuse of legal concepts shows the dangers of “weaponizacija” international law (Moran, 2024). Problems with Russian claims include lack of evidence of the systematic destruction of the Ukrainian group, the International Court of Justice's assessment that the claims are unfounded, and the abuse of the term “genocide” that trivializes actual cases of genocide.

5.1.3. International legal response

Proceedings before the International Court of Justice: Ukraine has initiated proceedings against Russia for violating the genocide Convention, the Court has issued provisional measures ordering Russia to cease military operations, but Russia is ignoring the court's decisions. The International Criminal Court issued an arrest warrant for Vladimir Putin for deporting Ukrainian children and investigating war crimes. The UN General Assembly adopted resolutions condemning the Russian aggression and suspended Russia from the human Rights Council.

5.2. Western Balkans: unresolved disputes and fragmentation

5.2.1. Kosovo: legal status in limbo

Unilateral declaration of independence (2008): Kosovo declared independence after unsuccessful status negotiations. The ICJ Advisory Opinion (2010) concluded that the declaration did not infringe international law, but did not address the legal effects of the declaration. International recognition: more than 100 countries have recognised Kosovo, but Serbia and its allies (Russia, China) do not recognise independence. The EU is divided -- five members do not recognise Kosovo.

5.2.2. Bosnia and Herzegovina: constitutional crisis

The Dayton Accords as the legal framework: Established in 1995 as a compromise to end the war, a complex constitutional structure with entities and constituent peoples, international control through the Office of the High Representative.

Contemporary challenges: the blockade of state institutions by Republika Srpska, disputes over jurisdiction between the entity and the state, the influence of external actors (Russia, Turkey, EU).

5.2.3. Geopolitical competition

Russian influence: support for Serbia in Kosovo, energy diplomacy (South Stream, Turkish Stream), promotion of “traditional values” against EU integration. Chinese impact: “17 +1” initiative for infrastructure projects, energy and transport investments, avoidance of political issues. EU approach: making accession conditional on respect for the rule of law, Berlin process for regional integration.

6. INTERNATIONAL ORGANISATIONS: DETAILED ARRANGEMENTS AND ANALYSIS

6.1. United Nations: Reform or stagnation?

6.1.1. Security Council: Structural problems

Composition and legitimacy: The five permanent members of the (P5) reflect the distribution of power from 1945, the lack of representation of Africa, Asia, Latin America, the right of veto allows decisions to be blocked by a single force. Reform proposals: extension to 24-25 members with new permanent members, restriction of veto rights or abolition, rotation of permanent positions between regions. Resistance to reforms: P5 refuses to share privileges, disagreements over new permanent members.

6.1.2. General Assembly: alternative mechanism

Resolution “United for Peace” (1950): It allows the General Assembly to act when the AC is blocked, used in the crisis surrounding Suez (1956), Ukraine (2022), resolutions are not binding but have moral weight. Contemporary role: Forum for Diplomatic dialogue, development of international law through resolutions, legitimization of international actions.

6.2. NATO: from defence to crisis management

6.2.1. Evolution of the Mission

Cold War role: collective defense against the Soviet threat, Article 5 as the foundation of the alliance, nuclear deterrence. Post-cold War transformation: Extension to the East (1999, 2004, 2009, 2017, 2020), out of area operations (Bosnia, Kosovo, Afghanistan, Libya), Partnership for Peace and Mediterranean Dialogues.

6.2.2. Legal challenges

Intervention in Kosovo (1999): without the approval of the UN Security Council, justification for humanitarian reasons, precedent for future interventions. Article 5 and modern threats: Cyber attacks, hybrid wars, terrorism, defining an “armed attack” in the digital age, collective response to asymmetric threats.

6.3. European Union: Supranational experiment

Common Security and Defence Policy (CSDP): Lisbon Treaty (2009) as the basis, Article 42.7 on mutual assistance, Article 222 on Solidarity. Operational capabilities: EU Battlegroups (never used), civilian missions (EULEX Kosovo, EUMM Georgia), maritime operations (Atalanta, Sophia). Integration challenges: sovereignty vs. integration, various security priorities of members, relationship with NATO.

6.4. OSCE: comprehensive approach to security

Three dimensions of safety: Political-military dimension (arms control and confidence measures), economic-environmental dimension (energy security, water resource management), human dimension (human rights and fundamental freedoms). Limitations and challenges: consensus as an obstacle (need for consent of all 57 members), geopolitical polarisation (different interpretations of Helsinki principles).

7. THEORETICAL ASPECTS AND FRAGMENTATION

7.1. Realism vs. liberalism: due diligence

7.1.1. Neo-realistic perspective

Structural realism (Kenneth Waltz): anarchical structure of the international system, States as rational actors maximizing security, balance of power as a stabilization mechanism. Application to the multipolar world: multipolar as more unstable than bipolar, greater possibility of erroneous calculations, right as an instrument of power, not constraint.

7.1.2. Neoliberal perspective

Institutional liberalism (Robert Keohane): International institutions facilitate cooperation, complex interdependence reduces the tendency to conflict, absolute gains more important than relative ones. Democratic Peace (Michael Doyle): Democratic countries do not wage war with each other, spreading democracy as a path to peace, international law as a product of democratic values.

7.1.3. Constructive synthesis

Social Construction of reality (Alexander Wendt): “Anarchy is what States make of it,” identities and interests are not given, but are constructed, norms form actors, not only regulate behavior. Application to international law: legal norms form state identities, internalization of norms through socialization, possibility of change through discourse practices.

7.2. The crisis of international law as discipline

7.2.1. Manifestations of crisis

Fragmentation: proliferation of specialised legal regimes, conflict between different legal systems, lack of hierarchy among norms. Politicisation: instrument of law for geopolitical objectives, selective application of standards, erosion of the difference between law and policy. Legitimacy deficit: calling into question the universality of standards, Global South's insufficient representation in the creation of rights.

7.3. Fragmentation into geo-legal order

7.3.1. Concept of geo-legal orders

Definition: Geo-legal order is a regional or civil legal system that reflects specific values, norms and institutions of a particular group of States or cultures. Characteristics: geographic or cultural connectivity, common value system, specific legal institutions, an alternative approach to global issues.

7.3.2. Main geo-legal rankings

Western liberal order: based on human rights, democracy, rule of law; institutions: EU, NATO, G7, OECD. Chinese model: emphasis on sovereignty, non-interference, gradual development; institutions: BRI, ALIIB, SCO. Russian traditionalism: “traditional values” vs. liberal norms; institutions: EAEU, CSTO, BRICS. Islamic legal system: Sharia as a source of law; Organisation of Islamic Cooperation (OIC). African approach: Ubuntu philosophy and African humanism; African Union.

8. CURRENT CHALLENGES AND ALTERNATIVE MODELS

8.1. Technological challenges

Cyber space and international law: use of existing standards (Tallinn Manual as an attempt to codify), new challenges (attribution of cyber attacks, private actors as cyber warriors) Artificial Intelligence: Autonomous weapon systems (ethical and legal challenges, campaign to ban “killer robots”), AI and human rights (algorithmic discrimination, privacy and surveillance).

8.2. Climate change as a security challenge

Legal framework: Paris Agreement (2015) with nationally determined contributions (NDCs), Ratchet mechanism, loss and damage. Security implications: Climate migration (legal status of climate migrants), resources and conflicts (water as a source of conflict, the Arctic and a new geopolitics).

8.3. Pandemics and global health

COVID-19 test: International Cooperation (WHO and restrictions, vaccine nationalism), legal challenges (limitation of rights during the pandemic, international responsibility, access to medicines as a human right).

9. CONCLUSION: THE FUTURE OF INTERNATIONAL LAW

International law is now at a turning point. The transition to a multipolar world has brought new dynamics that test the foundations of the post-1945 order. Due diligence shows that the challenges facing international law cannot be addressed by simple reforms of existing institutions, but require a fundamental review of the nature and role of law in the global system.

Key findings

Fragmentation as a reality: analysis of the main actors of the multipolar world shows that different visions of the international order lead to the fragmentation of the legal system into “geo-legal orders”. Instrumentalization of law: case studies of Ukraine and the Western Balkans show that different interpretations of international law are used to justify conflicting positions. Institutional crisis: an analysis of the UN, NATO, EU and other organisations reveals deep structural problems.

Scenarios of the future

Scenario 1: managed fragmentation - the international community accepts fragmentation as a reality and develops mechanisms to manage complexity. Scenario 2: New Westphalia Peace - a fundamental reform of the international system through a new “great agreement” between major powers. Scenario 3: full fragmentation - fragmentation leads to the complete collapse of the universal legal order.

Recommendations for the future

Short-term measures: reform of the UN Security Council through extension and restriction of veto rights, strengthening of regional organisations, development of new dispute resolution mechanisms in cyber space. Medium-term reforms: codification of new digital age standards, development of a legal framework for climate change, reform of international economic law. Long-term vision: developing a new conceptual framework for international law in the multipolar world.

Scientific contribution and Research gap

This paper contributes to existing literature through the development of the conceptual framework of “geo-legal orders” as an analytical tool for understanding the fragmentation of international law in the multipolar world. Unlike existing approaches that treat fragmentation as pathology, our approach recognizes it as a new structural characteristic that requires tailored theoretical and practical responses. The research gap filled by the paper refers to the lack of comprehensive analyses combining historical perspective, theoretical insights and empirical case studies into a coherent framework for understanding contemporary challenges of international law.

Perspectives for legal reforms and new institutes

The future of international law requires innovative institutional responses to multipolar reality. We propose the establishment of a “Council for the Coordination of Geo-legal orders” as a new body to enable dialogue between different regional and civilisation approaches to international law. In addition, it is necessary to develop “hybrid legal mechanisms” that can function in a fragmented environment - such as regional courts with a universal mandate or flexible contractual arrangements allowing different levels of commitment depending on the preparedness of States.

Final reflections

Despite all the challenges, international law shows considerable resilience. Its greatest weakness - dependence on the will of sovereign States - is also the source of its adaptability. Although often violated, it provides the only common language and set of rules that allow coexistence in a complex and fragmented world. The key question is whether international law will succeed in evolving in a direction that allows the coexistence of different civilization models, or whether fragmentation will lead to the complete collapse of the universal legal order. The answer to this question will shape international relations in the 21st century and determine whether the right can continue to serve as an instrument of peace and cooperation in an increasingly complex world. The future of international law will depend not only on great powers and their geopolitical calculations, but also on the ability of legal professionals, diplomats and civil society to develop innovative approaches that can bridge existing divisions. Finally, it is important to remember that international law has always been a product of its time. As it adapted to the transition from the feudal to the Westphalia system and then from the colonial to the decolonised world, so must the transition to the multipolar world.

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CONTROL AND ACCOUNTABILITY OF RELIGIOUS AND ECONOMIC ACTIVITY IN THE BULGARIAN ORTHODOX CHURCH

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ABSTRACT

The control over the activity of the divisions of the Bulgarian Orthodox Church is extremely important for the management of the processes, both in terms of the socio-economic and the religious activity. The purpose of this study is to examine some important aspects of control over the church's economy and to substantiate its importance for the Church as a whole. The study shows that to a large extent the control functions performed by the Bulgarian Orthodox Church, according to its Statute, are performed, but the deadlines and periodicity of this control are not observed. In a situation of attracting public funds with European and national funding, however, the general rules of control within the framework of the budget process apply. The technique of project financing on a competitive principle is applicable, and for this purpose in Bulgaria both measures listed in operational programs in the individual program periods and the budget program "Religious Denominations" through the implementation of "Policies in the field of the right to religious belief" are applied. As a new source of funds for the preservation and renovation of the building stock of churches and monasteries, public funds for the development of "pilgrimage tourism" appear, where the control over their spending is also public.

Keywords: control, control over religious activity, control over church economy, church economy, subsidies, Bulgarian Orthodox Church (BOC)

1. INTRODUCTION

The control as part of the management process also determines the parameters of the control function. The study of the structure of the control function dates back to the creation of classical management theory. In more modern views, several clearly distinguishable elements stand out: (1) development of standards and criteria, comparing the real results with them and taking the necessary corrective actions; and (2) "establishing standards, comparing actual activity with standards, correcting deviations from plans and standards" etc. (Simeonov, Lambovska, 2011). For the first time in the Bulgarian and foreign scientific literature, in the mid-1980s, M. Dinev placed serious emphasis on the elements of the control function, which precede the measurement of the actual state, and offered an argued position for their structuring (Simeonov, Lambovska, 2011). Of particular importance for the implementation of the control function is the definition of the control environment. For the purposes of the current research the control environment is accepted as the internal conditions for the implementation of control, determined by the full feeling/awareness, attitude and actions regarding control and its importance in the organization, as well as those external conditions directly affecting the process of the relevant activity (economic, social, religious, etc.), and therefore also of the implementation of internal control.

2. THEORETICAL FOUNDATIONS AND LEGISLATION BASIS

The church as an economic entity cannot exist without the formation of a certain budget including income and expenses, measured in monetary terms. The easiest and most obvious way to fill the revenue part of the church budget is the voluntary donations of believers.

But if the budget of the church is formed only from voluntary donations, then it would not be of particular interest to us, bearing in mind the fact that there are many other similar organizations forming their resources along the line of charity, at the expense of membership fees, transfer payments and etc. receipts (professional associations, children's and social homes, pension funds, etc.), whose role in the economy of a country is significantly greater. The church, however, not only spends the money and assets donated to it, but at the expense of various economic activities (Kagan, 1994). it replenishes the revenue part of the church budget. In particular, the church produces and sells goods and services, thus generating certain revenues, resp. profit. This flow of income and expenses is traditional for the BOP since the liberation of Bulgaria in 1878 and reflects sustainability for nearly 150 years. (Kalkandjieva, 2019). According to the Statute of the BOC, Chapter Two "Budget, Control and Reporting", Section I "Budget", in Art. 231 and Art. 232 define the income and expenses of the BOC and resp. the consolidated budget (See Table 1).

Table 1. Statute of the BOC, art. 232 and art. 232

Art. 231. (1) The revenues and expenses of the Bulgarian Orthodox Church - the Bulgarian Patriarchate - the Holy Synod, the stauropygial monasteries, the metropolitans and their divisions are foreseen and authorized in budgets for one financial year. (2) The Holy Synod provides the remuneration under Art. 135, item 21 with a budget formed by revenues in an equal percentage of deductions from all metropolitans, deductions from stauropygial monasteries and other revenues. (3) The financial year coincides with the calendar year. (4) Church property, income and expenses are used according to their intended purpose. Art. 232. (1) The Holy Synod approves the consolidated budget of the Bulgarian Orthodox Church - Bulgarian Patriarchate. (2) The consolidated budget consists of the budgets of: 1. The Holy Synod; 2. metropolises; 3. the stauropygial monasteries; 4. secondary and higher theological schools; 5. institutions directly subordinate to the Holy Synod. (3) The diocesan metropolitan approves the consolidated budget of the metropolis, which includes the budgets of churches and diocesan monasteries. (4) The budgets under para. 1-3 are prepared by the relevant financial and accounting departments.

The church, as a collective concept, in the form of its divisions - churches and monasteries, produces and offers on the market a wide variety of goods and services that are directly related to church activity or are the result of real economic activity - production of agricultural products, products of the processing industry, cosmetic products, etc. They can be both material objects necessary for the performance of religious rituals (eg, candles), and also include the performance of the corresponding ritual by the priest (such as baptism, funeral rites, consecration and etc.). But if the material objects of purchase and sale can be described and analyzed with the help of the categorical apparatus of economic theory - starting with the factors of production and ending with the principles and elements of the market conjuncture, then the services offered by a priest are a very specific good. In this case, the very principles of economic relations are in conflict with the principles of religious behavior. This fundamental conflict is so obvious and so deep that it suggests the possibility of talking about completely different, and in a certain sense, opposite archetypal¹ models of economic behavior.

¹Note: An archetype in psychology is a model of an object, personality, or pattern of behavior. Sometimes the term is used with the meaning of stereotype.

In the first case, it is about a contractual model of mutually beneficial relations formed on the basis of market principles, in the second - about an act of unconditional commercialization of the services offered by the priest, i.e. the invisible spiritual principle collides with the harsh reality of everyday economic existence. The analysis of the socio-economic activity of the Bulgarian Orthodox Church (BOC) is related to the definition of the status of the independent legal entity, which is the bearer of economic and social relations (Iliev, 2017). In the socio-economic turnover, only those local divisions of the religious denominations, which are recognized as legal entities by virtue of Art. 10 of the Law on Religions². According to the Statute of the BOC, Art. 13, the legal entity that independently carries out religious, social and economic activities is the Church with the specific name in the given settlement (See Table 2).

Table 2. Statute of the BOC, Art. 13

Art. 13. (1) <i>The Bulgarian Orthodox Church - Bulgarian Patriarchate and its local divisions - metropolises, churches and monasteries, are legal entities.</i> 2) <i>Inseparable members of the legal entity of the Bulgarian Orthodox Church – Bulgarian Patriarchate are the metropolitans and stauropygial monasteries as legal entities and as local divisions in its diocese and jurisdiction.</i> (3) <i>The seat of the Bulgarian Orthodox Church - Bulgarian Patriarchate is in the city of Sofia.</i> (4) <i>The seat of the metropolis is the settlement defined in art. 3 and Art. 4.</i> (5) <i>The seat of the church is the settlement in which its temple is built.</i> (6) <i>The seat of the monastery is the settlement in or near which it is located, or a settlement close to it.</i>

From the point of view of the above-mentioned hierarchy of legal entities in BOC, the delegated control functions, which are specified in its Statute, are also:

- First of all, in Art. **Art. 58.** item 28 it is stated that the powers of the Holy Synod in full are: yes . supervises that candles are used in public and private worship that bear the distinguishing mark of the Bulgarian Orthodox Church, approved in accordance with the relevant order, and that they are produced in a church candle foundry, approved by a decision of the Holy Synod;
- Secondly, in **Art. 121**, item 5 and item 6, it is said that the powers of the Diocesan Council are to review regularly every three months, and when it finds it good - and exceptionally, the accounts of the diocesan treasurers-accountants and to review their reports on the implementation of budget at the moment. The report is sent to the Holy Synod for final verification by the commission for verification of church accounts and to require revision of the accounts of the episcopal vicarages, church boards, monasteries and other diocesan divisions;
- Third, in **Art. 126.** it is stated that the episcopal vicarage is an institution of the Metropolis, which does not have the right to an independent budget, and it is led by an episcopal

²Note. According to Art. **10.** (1) Traditional religion in the Republic of Bulgaria is Eastern Orthodoxy. It has a historical role for the Bulgarian state and current importance for its state life. Its spokesman and representative is the self-governing Bulgarian Orthodox Church, which under the name of the Patriarchate is the legal successor of the Bulgarian Exarchy and is a member of the One, Holy, Congregational and Apostolic Church. It is led by the Holy Synod and represented by the Bulgarian Patriarch, who is also the Metropolitan of Sofia. (2) The Bulgarian Orthodox Church is a legal entity. Its organization and management are defined in its statutes.

vicar appointed by the metropolitan, who has the following powers in the spiritual district: to review monthly the accounts of the accountable persons at the vicarage and to send the compiled act to the metropolis, as he makes his notes on the revision in each parish in writing in the special revision book of the church board, such as is available at every church board, and reports to the metropolis about the findings;

- Fourthly, it is important to note that the need to control the activities of the divisions of the BOC, which are legal entities, is predetermined by the fact that the officials in the Church, who are assigned to receive and spend money, as well as to purchase, store and sell material objects, are accountants and as such bear material responsibility for the material and/or monetary funds entrusted to them and carry out their activities in accordance with the Statute of the BOC and the current legal acts. (Statute of BOC, section III, "Control and reports", art. 245)

- Fifth, by June 30 of the current year at the latest, the Holy Synod examines and accepts the reports on the implementation of the budgets and, if necessary, orders the implementation of audits on the implementation of the obligations for the deduction of funds under this Statute. In the case of established violations, he requires the drafting of audit acts for the realization of property liability by the responsible persons. In order to control the spending of the funds of the Bulgarian Orthodox Church - Bulgarian Patriarchate, the Holy Synod assigns general and specialized audits when there are doubts about the lawful spending of the funds, proposing the imposition of punishment on the guilty persons. The revision act is delivered to the read person, who can object to the Holy Synod within seven days. (Statute of BOC, section III, "Control and reports", art. 247)

- Sixth, the diocesan metropolitan exercises financial control through financial auditors. The reports on the budgets, approved by the diocesan metropolitan, are checked by a diocesan financial auditor and, based on his report, are submitted for consideration by the Diocesan Council. The diocesan metropolitan is the one who checks and accepts the submitted report and can order an audit and the pecuniary responsibility of the guilty persons. (Statute of BOC, section III, "Control and reports", art. 248)

The main conclusions that can be drawn at this stage relate to the existence of internal regulations for the implementation of control mechanisms within the budgets of the individual units of the BOK. However, when policies are applied to attract public funds for the renovation and preservation of temples of religious denominations as part of the cultural and historical heritage in Bulgaria and the EU, the general rules for control over the spending of funds with European or national funding are applied. A similar approach has been applied on both sides of the lower Danube River (in Bulgaria and Romania), where churches and temples are priority sites for the development of pilgrimage tourism (Dragan, 2024), (Zahariev, Prodanov, Ivanova, & Kichukov, 2021).

3. EMPIRICAL FINDINGS

In this regard, the question of whether the BOC exercises the appropriate control over the activities of its divisions from the point of view of the above-mentioned powers is interesting. In the conducted survey (See *Figure 1.*) among priests and persons working in the structures of the Church, it turns out that nearly 10% of them answered that such control activity (audit, audit, etc.) was not carried out in their organization (church, monastery, and diocese). In practice, these are churches/temples that do not work permanently.

This finding corresponds to a study conducted (Iliev P., 2019, p. 136) according to which in almost half of the churches, the weekly attendance is up to 10 people on average, and if we add those in the range of 11 to 20 people weekly attendance, it turns out that 2/3 of the churches are visited weekly by up to 20 people. This corresponds to the fact that in nearly 2/3 of the BOC houses of prayer only Saturday-Sunday services or on certain occasions are held. A weekly attendance of laymen and pilgrims over 50 people is observed in only 8% of churches.

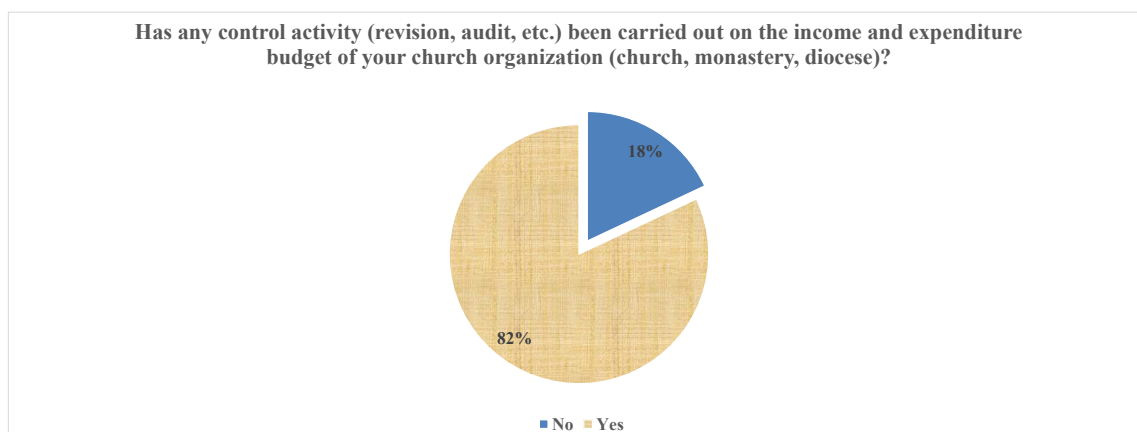


Figure 1. Implementation of control activities by the control bodies of the BOC

The next question from the survey (See Figure 2.) shows that the respondents answered the previous question correctly, because exactly 9 respondents answered that no control was carried out by the authorized bodies and persons from the BOC. More than half of the respondents stated that an annual revision is made regarding the budget for revenues and expenses, which means that the procedures laid down in the Statute of the BOC are largely followed. However, for 26% of the respondents, such control is carried out rarely (2 years and older). This finding again confirms the study conducted more than 5 years ago (Iliev P., 2019), according to which the frequency of church services confirms the fact that 16% of the state of prayer houses is bad, since in 15% there is no service from the temple buildings. In nearly 2/3 of the churches, services are held only on certain occasions or Saturday-Sunday services are held, and almost 100% of these churches are in settlements of the so-called rural municipalities, where the population grows only on weekends. Daily services are conducted almost exclusively in populated areas (large regional and municipal centers).

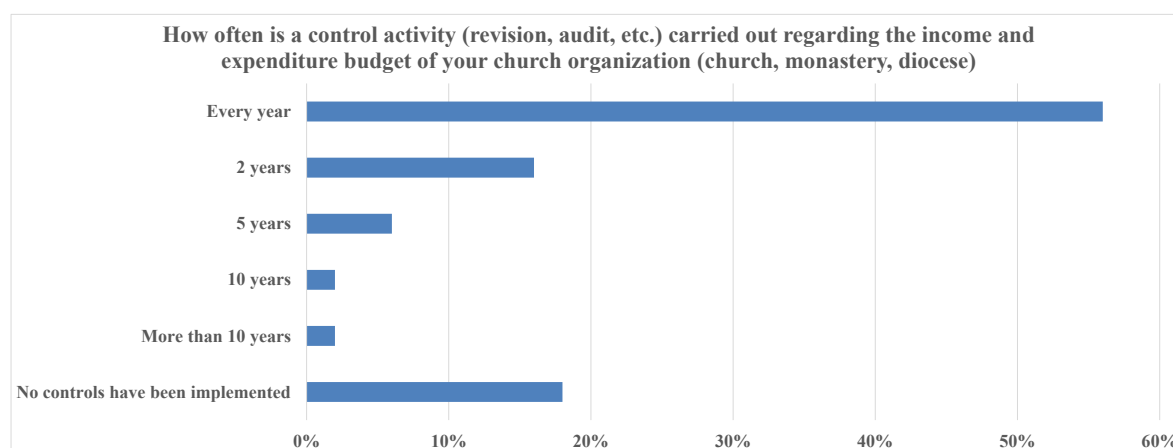


Figure 2. Frequency of implementation of control activities by the authorized bodies and persons of the BOC

In this regard, the Bulgarian Orthodox Church represents a typical example of a traditional hierarchical religious organization, and as such, at each of its hierarchical levels, realizes certain costs and generates benefits or losses accordingly. Despite the existing commercialization of intra-church relations, the Church cannot be referred to either the business sector, the public sector, or the tertiary sector of non-profit organizations, forming a fourth element of the sectoral economy. This theoretical paradox is particularly interesting when it comes to the participation of the Bulgarian Orthodox Church as a beneficiary and recipient of funds under the Operational Programs financed by the European funds (Iliev, 2016). In this case, the question of control regarding the used grants arises. ***The practice is that the control is temporary and is carried out by the Managing Authority, in this case the State Agricultural Fund, within 5 years. After this period, the beneficiaries are not subject to control activity and inspection.*** During the first program period 2007-2013 after joining of Bulgaria to EU, the Bulgarian Orthodox Church (BOC), resp. the local divisions of the religious denominations were beneficiaries only under the Rural Development Program (RDDP), measure 322 "Renewal and Development of Settlements". In Ordinance No.24³, Art. 4 explicitly records the activity of „reconstruction and repair of buildings of religious significance and improvement of adjacent spaces, including vertical layout " (See Table 3).

Table 3. Ordinance No. 24, Art. 4.

Art. 4. (1) Financial aid is provided for activities performed only on the territory of settlements:
1. rehabilitation of public green areas - parks and gardens, playgrounds and their facilities, including. supply of equipment;
2. reconstruction and repair of public buildings of local historical and cultural significance and improvement of adjacent spaces, including vertical layout;
3. reconstruction and repair of buildings of religious significance and improvement of adjacent spaces, including vertical layout;
4. repair of facades of private buildings and adjacent ones

Ex. DFZ, PRSR 2007-2013

Figure following on the next page

³ Note: Ordinance No. 24 is the normative document defining the legal framework for application, approval, financing and implementation of the project proposals of public institutions (rural municipalities without agglomerations, community centers, divisions of religious denominations, YULNC for public and private benefit)



Figure 3. Temples and monasteries as objects of cultural and historical heritage

The purpose of measure 322 was to improve the living environment in rural settlements. In this regard, the granted financial aid covers 100% of the permitted activities carried out, with a maximum amount of the grant for the churches/monasteries, the BGN equivalent of 500,000 euros. A peculiarity of the local branches of religious denominations is the possibility that the granted financial aid may also include value added tax (VAT), since almost 100% of them do not have VAT registration and practically could not reimburse this indirect tax. This exception does not apply to other beneficiaries. (See Table 4, Ordinance No. 24, Art. 7.)

Table 4. Ordinance No. 24, Art. 7.

Art. 7. (1) (Amended - SG No. 11 of 2010, in force from 9.02.2010) The financial aid is in the amount of 100% of the total allowable costs for projects of municipalities and for projects submitted by applicants - non-profit legal entities, community centers or local divisions of religious denominations that do not generate income and are in the public interest.
(3) The maximum amount of allowable costs for a project presented by community centers, local branches of religious denominations, as well as by non-profit legal entities, civil societies of individuals and/or legal entities established for the purpose of carrying out construction works in connection with renovation of facades of private buildings, is the BGN equivalent of 500,000 euros.

Ex. DFZ, PRSR 2007-2013

As a result of the implementation of the above measures, European funds have been directed towards construction and installation works to improve the appearance of religious buildings and their adjacent spaces. Among the approved projects are those for the repair of bell towers, the construction of fountains in the courtyards of the temples, the replacement of window frames and roofs. In addition to restoration and conservation, the costs of reconstructing the interior of the temples are also eligible. After the completion of the measure, implemented projects were reported not only with temples of the Bulgarian Orthodox Church as beneficiaries, but also all local divisions of the religious denominations (monasteries, churches, mosques, metropolitan sees, muftis, etc.).

In the next programming period 2014-2020, support with European funds for the budgets of temples in Bulgaria has been continued with sub-measure 7.6 "Research and investments related to the maintenance, restoration and of the cultural and natural heritage of villages" from the Rural Development Program (RDP) 2014-2020. An additional source of funds in support of temples is the budget program "Religious Denominations" through the implementation of "Policies in the field of the right to religious belief", where the funds are provided from the annual state budget (Brusarski, Zahariev, & Manliev, 2024). Application for these funds is on a competitive basis, including in situations of urgency for emergency repair activities usually after natural disasters that have caused damage to temples. In all these cases, the general rules for beneficiaries of grants with European and national funding apply, where control is applicable at every stage of the capital budgeting process (Prodanov, 2012). In the context of the Covid-19 pandemic crisis, policies were also implemented to support the health protection of church employees (Zahariev, Zaharieva, Mihaylova, & Nikolova, 2022). Additionally, funds were budgeted for improved sanitary protection of the temples themselves, for which a lockdown was not allowed in Bulgaria at any stage of the pandemic.

4. CONCLUSION

The conclusion that can be drawn is that, to a large extent, the control functions performed by the BOC, according to its Statute (Bulgarian patriarchy, 2008), are performed, but the terms and periodicity of this control are not respected. One of the reasons for this state of control activity is the lack of a unified register and map of the temples in Bulgaria. According to the data of the Directorate for Religious Confessions (up to the second half of the last decade), a total of 8,000 churches and monasteries of the BOC were counted. But the figure is not final, as the data are from 260 municipalities and 11 dioceses. For example, the ongoing census found many private chapels that are not registered in the Church, but are counted in the municipalities. This register is extremely important for carrying out control activities, as well as for the attraction and utilization of RDP funds, as it ascertains, in addition to their number, but also their location, year of construction, their condition, usability (working, non-working), estimated attendance and status (cultural monuments – of national, local or world importance).

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ASPECTS OF USA-CHINA TENSIONS ASSOCIATED WITH AI

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ABSTRACT

As the title implies, this article deals with the tensions between USA and China, which are associated, or otherwise connected to Artificial Intelligence (AI) – its utilization and potential consequences. The first chapter – as the introductory part contains both the, already present, and everyday lives influence of the AI, along with the efforts of its weaponization. Special attention is devoted to presenting an increase in the number of military targets, within the segments that are, usually, neglected or forgotten, thus illustrating how every facet of the human's lives is exposed to it. Final segment of the first part is devoted to short overview of most commonly used, specialized chips for the AI technology. Second chapter deals with the logistical chain for the AI, and Western dominance over it, which is being transposed in legal acts, them additionally fueling the tensions. Some usual, and, potentially, flawed reasoning is being analyzed, along with the possible impact of BRIKS countries association existence. Within the third chapter, new developments, with their influence, within the relationship are being presented. The final part consists of the conclusions on the particular topic, with the review of the most current occurrences. At the end – the part containing the conclusions have been expanded wit the specific and very important issues (such as misalignment and misuse of AI), which fall, somewhat, out of the scope of the article, but must never be allowed to slip one's mind, because of their importance, and dire consequences, they may exert, if applied.

Keywords: *AI, China-USA tensions, weaponization*

1. INTRODUCTION

The genie (Artificial Intelligence - AI) is out of the bottle. Regardless of weather that genie is in line with Arabic tradition of the myth (malevolent creature comparable to demons in Christian belief system) or in line with popular Hollywood movies (creature that only grant wishes), it is here to stay as long as there is one single memory unit with power supply. That is if humans haven't polluted the outer space already, on which occurrence fear already exists [1]. Today the AI systems already have a widespread use, which the following examples may illustrate:

- Students can already use public domain systems for a creation of papers, which could raise a question on scholar or academic achievements and/or level of real knowledge
- Initial stages of job interviews are already conducted by AI, meaning that a human already needs to convince a computer algorithm, with its own system of conclusion/drawing, that they are the best qualified candidate for the job
- AI systems are already in use for facial recognition and connected to databases of the law enforcement and security agencies
- AI is a part of traffic light network and strategic civilian infrastructure management (such as, but not limited to, power production, distribution grids, water supply, district heating etc.)

- Also, AI is becoming more and more dependent on for scientific researches, both in creation of new AI systems and their capabilities as well as in the other areas of research (medicine depicted as a most desirable area)
- Due to AI, a totally new segment of the sex market is created [2], with the first suicide, associated with the unhappy relationship with AI, already occurred. There are new „moral dilemmas“ rising on the issue whether sleeping with another person or love-bot can be interpreted as cheating on the personal love-bot

Even with disregard to use for personal purpose or social networks, all of this means that AI systems already strongly affect human's daily lives. As the official history of human civilization teaches, there are no scientific or other discoveries that have not been weaponized. The same goes for AI, whose utilization could, potentially, totally change warfare strategies, in all of its components: sea, land and air. Currently different platforms are being developed, such as Russian systems Uran-9 [3] and Fedor [4], USA drone swarms [5], etc. As AI driven drones are concerned, they can revolutionize biological and chemical warfare, as well. Compared to World War I, where chemical agents were released en mass, creating a huge cloud lingering for hours and presenting a danger to all sides and civilian population, depending on the air movement, in the tomorrows utilization, small sized drones (dimensions of a Hornet-drone, and similar) could carry up to a few grams of chemical agents and target each adversary soldiers individually, releasing its cargo upon target impact or in its near vicinity. This would allow increase of effectiveness, while strongly limiting the amount of the agent released, thus allowing dispersion of its concentration, and its drop bellow safe levels, within minutes. This has to be especially taken in the account in light of AI driven development of toxins few order of magnitude more lethal than the toxins created by humans [1]. Although, there is a rising trend of network-centric warfare, which is even partially operational, with expected revolution, primarily within air combat, via existence of planes/network-centric nodes, commanding autonomous or semi-autonomous loyal-wingman, dedicated to ground strikes or visual-range areal combat, the most impactfull weapon systems would be AI driven stand alone drones. In that line, perfect, nuclear powered doomsday weapons would be systems like Russian Poseidon and Burevestnik, capable of staying on patrol for months and even years, awaiting for the order to strike. It should be noted that weaponized AI systems, them not being weapon systems by their own right, could render weapons of mass destruction less important in the offensive role, and bring it down to the level of purely retribution means. Such AI systems could be used for offensive purposes, exerting mass casualties, especially amongst civilian population, by targeting and disrupting vital civilian infrastructure such as energy systems, water supply systems, food logistical chains, waste disposal and treatment, etc. This is especially applicable for developed countries, in which most of the population dencity is located within urban areas/cities. Operationalisation of AI brings forward another aspect of the warfare, which is usually neglected, and that is the increase, in the number, of the legitimate military targets, encompassed by AI critical technical infrastructure, such as power supply (since large AI centers require large amount of constant and stable energy input, which, by some accounts, will lead to the doubling of the power supply demands within USA, within the next 3 years, which, in turn, could demand construction of new, additional, power production and distribution facilities), as well as to the water supply infrastructure, since large AI facilities require very significant amounts of water for cooling. All of that not even taking in the account the negative environmental footprint. So, combined with previously shown influence on everyday life, this depicted military aspect demonstrates that all facets are, or will be influenced by AI, bringing forward the architecture of the AI systems. Black-boxed architectural philosophy is more or less universal: small(er) number of entry and exit nodes, with the number of between-layers of large(r) number of nodes, each node, in each layer, being connected to all the nodes of the previous and following layer.

Nowdays, those nodes are purposely designed and produced for the utilization within AI structures. Those nodes are specialized AI chips, such are NVIDIA N100 and H100.

2. THE WAR BEGINS

Logistical chain for the AI chips is a very complicated one, with each chip traversing different borders very large, two-digit, number of times. However, there are certain important points within that logistical chain:

- Best architectural design is done by Nvidia and Google (USA companies)
- Manufacturing of very expensive and complex machinery for AI chips production is done by ASML (Dutch company)
- Chips production is done by TSMC (Taiwanese company) – curiosity associated with this company is that during the first Trump administration, USA tried to move to- or clone in- that factory on the USA's soil, an effort which did not yield any result.
- Sales of these specialized chips goes through Amazon web service, Microsoft Azure and Google Cloud, representing 63-65 percent of the market [6]
- Interestingly enough, packaging is dominated by China produced machinery.

If the last bullet is disregarded, the conclusion is evident by itself, it being that design is dominated by USA while production is dominated by its allies. Present tendency is that this domination must be maintained:

- over any single country, with China being especially singled out, which was formalized into law in August 2022 through so-called “Chips Act” [7]. By that Act it is prohibited to export:
 - the latest generation of specialized AI chips
 - software and codes for creation of AI, which are of the USA origin
 - equipment for chips production which are of the USA origin, despite the fact that realistically, main productional facility is located on Taiwan and in the Netherlands
 - any and all USA-produced components

This prohibition refers to all private and legal persons, including the legal persons (co)owned by USA's subjects, operating on the China's soil. Some concerns on the potential for private and legal persons liability, in case of breaching these bans, even if they are not US subjects, are being bounced around.

- and by all costs, including entering full-blown hot war

In spite of China being singled out as an adversary country, which is in conjunction with strongly present tensions within the relationships between China and USA, it is clear that division onto “USA and its allies versus all others”, e.i. Cold War mentality prevails. This goes so far that amongst closed, well-informed circles, speculations on expectations for Taiwanese side to blow up the mentioned productional facility, in case of China's decision to reunite its rogue province through use of arms, exists. This incapacitation of production facility would, supposedly, delay or hamper China's AI capabilities on the long run. Within this, speculated-upon scenario, USA would, supposedly, provide armed aid to the Taiwanese side, in which conflict USA would win, due to its military AI capability advantage. Although, at the first glance, this kind of reasoning could appear to be reasonable, within it there are a number of flaws. The first and the most obvious flaw is that this factory incapacitation might affect China's AI capabilities, it would, in the same way, hamper capabilities of all others, USA included. There is another facet to this question, i.e. what kind of advantage or leadership role, USA has, or to be more precise, in which aspect of AI utilization.

The most dominant aspect of AI development within the USA is centered around LLM (Large Language Models) while the general consensus is that China has a leading role within the segments of facial recognition and smart cities management systems. Secondly, although used, AI systems are not yet prevailing segment of the C³ (Command, Control, Communication). In other words, when armed conflict is concerned, excluding nuclear exchange, and/or MAD (Mutually Assured Destruction), classical military indicators, such as, but not limited to, number of soldiers and equipment, sophistication of widely used digital systems, moral and fighting spirit, etc., have to be taken into account. And within of most of those parameters China's military might is close to-, or even surpasses, the USA's one. When USA's role in the China-Taiwan relationship is been deliberated upon, usually, the origin of the Taiwanese people is somehow lost from site, that being that the Taiwanese are, by origin, Chinese people. Some of them may have different views on social and political functioning, compared to main-land Shina's views, but they are Chinese, non the less.

Within this, supposed, scenario which includes diversion, two premises are included:

- the first, and the very strange one at that, is supposing that the Chinese army does not know, and/or is incapable of securing critical/strategic infrastructure, while conducting military operation
- the second rises a question of potential saboteurs self-sacrifice, since Taiwan is an island so the extraction of the perpetrators, of such an action, would be not so easy thing to do, i.e. it would, most probably, be a suicide mission. The question is why would someone, especially if being of Chinese origin, undertake such a potential sacrifice for purely American interests.

What causes a certain ammont of wondering, is American non-application of their own way of reasoning. From the specialized literature and present information within well-informed circles, it is clear that USA is trying to preserve its perceived leadership position, within the segment of AI, with tendency not to allow any individual country to come close or endanger that position. But, since the logistical chain is scattered around Western or West-dominated countries that's were, obviously, syntagm "USA and its allies" comes into play. So it is a matter of utilitarian cooperation. But, even if one particular country could not approach the technological level of USA, why wouldn't this cooperative approach be applied to formal or informal group of countries, different form above mentioned syntagm? The first possible choice that comes to mind would be the BRICS association

2.1. BRICS countries

The BRICS includes ten countries: Brazil, China, Egypt, Ethiopia, India, Indonesia, Iran, Russian Federation, South Africa, United Arab Emirates, with nine partner-countries. Between 45 (only BRICS countries) and 54,6 (partners included) percent of the global population resides in those countries, with between 28 and 35 percent of world's GDP, data depending on the source. Members of the association encompass countries with a very significant knowledge and technological base, with R&D and productional functions well established and developed. So, while it was deemed that no individual country could approach the AI development level of USA and its allies, which was highly speculative theory by itself, as the most recent occurrences demonstrate, why was it deemed that this association, as a whole, or through collaboration of certain countries within it, could not? Usual explanation is that BRICS countries do not present a formal block in any sense of the meaning of the term. However, there is one "but": internal cooperation within the association is based on policies. And policies are visibly or invisibly extension of the politics.

This especially comes in to light when certain facts are taken into account:

- the association is spearheading the movement for de-dollarization of the world's economy. If fully implemented, this kind of result would deal total economical collapse of the West, which, naturally, would exert strong negative impact on any or all industrial and technological development, AI included. Small-section preview of the chaos could have been observed in connection to the energy prices, in Europe, evoked by the sanctions imposed on Russia, during the ongoing West's proxy-war on it
- the official date of death of uni-polar West (e.i. USA) led New World Order, marked by meeting between the Russian and American delegations, in the capital of Saudi Arabia, on February the 18th, 2025. The main outcome of the meeting was formal re-institution of Russia as the second world pole. But, taking into account Russia's strategic partnership with China, and the fact that the both countries are amongst founders of BRICS alliance, it could be deduced that there is not only a third pole-that one being China, but that BRICS countries represent a crystallization point for global redistribution of power and influence.

This potential redistribution could, potentially, have a significant impact on the territorially, and, formally, by the number of inhabitants, smaller countries, ones which choose to align themselves with BRICS, and which, in the past refused to bow and serve to the Die Neue Ordnung of Nazi Germany or New World Order of the Anglo-Saxon liberal capitalism. For maintaining the honor and dignity they were punished by the mass murdering wannabe world masters, not just by customary killing, but by the methods of extermination, perpetrated by the master's loyal servants, which were, in times, disgusting even to the masters-killers [8], all of it accompanied with the looting of the honorable ones' history, culture and territories, which were given to the servants of the Order. Non the less, even when the masters of the Order of evil were crushed, the servants received protection from justice [9], maintaining the course and awaiting for new or old masters to ride again, in order to continue the deed [10]. And this is not the thing of the past, but continues [11] till date [12], [13], [14].

So, this could provide the hope for the righteous ones to reclaim the territory, the language and the full cultural and historical inheritance. Answer to the question if this would cause an instability within the association, region or in broader area is no: puppets without puppet-masters are just rags. What might cause friction is the well established historical habit of puppets/servants to become turncoats, to leech onto the victors, in order to save their bloody loot, awaiting for the next round of committing atrocities, while preserving the (addopted) goals and ideology of the masters fallen out of power. It is clear that mechanisms of protection against such reoccurring historical behavior must be strictly enforced. Mentioned policies being based on politics aside, it would be interesting to follow weather BRICS countries would undergo somewhat natural evolution: established policies were derived from the mutual economic and financial interests. And that precisely is the point – the existence of interests. Those, commonly agreed upon, could lead to a stronger internal connecting, which, in turn, can lead to more formal grouping. But, inevitably, taking into account a global political division and struggle for power and influence, interests of BRICS will be in conflict with other, already existing, formal or informal group's interests. The point is that the rise of BRICS countries and increased desire, from other countries, to align themselves, or join, BRICS association, will lead to the increase of political and financial influence of the BRICS, enabling that group to, possibly, eventually become even more preferable option to the West-led UN. Even disregarding possibility for the BRICS association to become a new organization on the global level, through offering of the more fair and just cooperative system, there is another very important segment that needs to be considered.

Introduction of new set of rules, regardless of whether they being more fair and just or not, those will be in the direct collision with the existing ones. The presence of new rules, them being disliked by the existing pyramidal-plundering ones, needs to be protected, since the history demonstrates that the current rulers strongly dislike, and do not accept the tendencies for their power to be diminished or stripped away. For protectional purposes, good will and intentions are not enough, ever. So, the logical step would be the increase in the military cooperation amongst BRICS countries, through some kind of formalization of that cooperation. This does not, necessarily, mean that another military block such as NATO, or ex Warsaw pact will be created. There is always a possibility for a number of bilateral agreements, such as the agreement between Russia and North Korea, to be signed. One way or the other, the New World Order is on its death bed and a New-New World Order is rising, with a dawn of the better for all mankind.

3. NEW DEVELOPMENTS

As reported [15] early period of 2025 saw preparation of the new draft-law which may be cited as “Decoupling America’s Artificial Intelligence Capabilities of China Act of 2025”. The main point of the proposed law is total decoupling of American and Chinese AI technologies. This comes after some efforts for USA-China collaboration via USA (and from the West, in general) scientists working within the surrounding of Chinese universities and companies. Those trials did not yield desired effects due to China’s security consciousnesses and meticulous protection of the methods, facilities and achieved results. This second legislative ban (after "Chips Act") derives from the West's, especially USA's, goal to stay on the forefront of research and utilization, and to protect its perceived technological domination. Although this new act mostly reiterates the stipulations of the Chips Act, it prohibits cooperation with Chinese universities, research laboratories and technological companies. Penalties for transgressions include fine up to 1 million USD – for individuals; for companies fine of 100 millions USD, accompanied with obligatory damage compensation in the amount of tripled realized profit; for foreign citizens breach of this law can be treated as serious criminal act within the boundaries of the Immigration Law - amongst other things, this means that anyone transporting technology into China can be deported from the USA. Specific part of this law is a ban on utilization of Chinese DeepSeek AI model, already in force, within key institutions, such as Ministry of Defence, Congress and NASA, with expected drastic repercussions for violation of this ban. Associated with DeepSeek model, conflicts between USA and China, are possible, and even expected, since there are reported [15] accusations from the American company on the utilization of the OpenAI API system, by Chinese researchers, without adhering to the IP rights. This supposed API utilization enables smaller AI networks to be trained from larger and more powerful models, for the fraction of cost of one training run, which can go over 100 million USD/per training run. This stance can be deemed as somewhat ironic since big companies do the large training runs on (questionably) open source data. Those supposedly open sources actually incorporate sources like Youtube and social networks. In none of the training cases, explicit permission from the owners, authors or content creators were asked for. There is another serious concern, i.e. serious question, that one being whether these training runs incorporate data from the Dark Web, or not. Till date, this question has not been publicly answered. Although these new developments can seem to be adding a new fuel to the fire of USA-China’s tensions, actually there is a silver lining. Chips Act’s introduction raised concerns that its implementation could constitute a major contributor to Chinese reunification to Taiwan through armed means, with subsequent USA’s military intervention, leading to military conflict between USA and China.

But this new proposed law demonstrates widespread and usual flaw in the West's way of thinking: when deliberating upon its technological advance over China, and pronouncing it to be 5 to 10 years – it, usually, presents itself as time-span of 6 to 24 months, as was obviously in this case, as well. And, paradoxically, that flaw in reasoning presents a silver lining, since this new American law demonstrates that China caught up, leaving the factory located on Taiwan on the edge of the scope of vital Chinese national interests, thus somewhat decreasing the possibility of the armed conflict.

4. CONCLUSION

It would be too simplistic to state that USA-China tensions are determined by-, or, even, contained within the segment of AI. They are not – there are a lot of stones, AI being another one, albeit the very visible one, in the wall of understanding between the two countries. Problem is, additionally, irritated by the weaponization of the AI, both in its military, as well as in not so visibly military function, i.e. offensive capabilities. Main obstacle could be attributed to the collective West, determined by the syntagm "America and its allies", and the West's self-infatuation, with the perceiving of its position, as being the position of the "chosen ones", with the perceived role "to lead", usually meaning – modeling others to West's own interests and subduing them accordingly. The sparks from the omni-present clash overshadow certain occurrences:

- sparks of the strikingly visible tensions can be blinding, thus diverting attention from the other nations', such as Russia, Iran, UK, EU on the certain level, etc, aspirations and endeavors. Currently, they perform their work in peace and silence, with spot-lights being pointed in another direction. From time to time, information do pop up, but the question is how accurate and complete is it.
- When EU, i.e. grouping of states, is mentioned, it is worth noting that the New World Order is thing of the past, along with the West's ability to "keep other countries in line" and stop them from developing different sorts of technology, including AI, by bullying them into submission. Now-days, with more than 2 poles in existence, globally, it is only natural that other countries can have the similar approach to mutual cooperation, as a counter-balance to "America and its allies". It is high time for the West to understand and accept this fact, along with the fact that it can not do anything about it.
- AI is here to stay. But, it is an unknown technology – what happens within the process is still a black-box. And, there are a number of concerns, even depicted scenarios in which misaligned (meaning system that does not fulfill its intended purpose) AI system(s) could seek to subdue or destroy the humans. Fraudulent behaviors have been already observed. Yet, the research, and, even more dangerously, the utilization is picking up the pace. This is characterized by the run for the money (time-to-market being as short as possible in order to get a bigger market share), and the need for military supremacy, i.e. weaponization of the AI technology. And, just because of that, R&D is fragmented, and technology made available to general public.

If AI technology is viewed upon just as a product, it lacks the usual norms and procedures. For example: there are no formal education-experience requirements for people engaged within this area of R&D – and, as a consequence there are a lot of wrong experiments, conclusions, etc. Within the development; there are no health and safety standards and requirements for the new technology or its testing – everything is done "on the go", even upon release on the market (if done at all); there are no official bodies to check the real state of things (such is market surveillance for other products), etc.

What is forgotten in that approach is that – if something like that occurs on a wider level – misaligned AI(s), willing do subdue or destroy humans, will not make a difference between Americans, Chinese, or any other nation or ethnic group, for that matter, but will see humans as a collective threat, and will deal with it on a species level.

What may be as bad, as the previous item, is the fact that there is, more-or-less, open access to the technology. Other technologies, which possess the capacity, if misused, to create a great damage to the individuals, or large groups of people, do not have open access to them, examples being any type of nuclear technology, access to any, especially energy production or distribution facilities, research facilities engaged in the areas of toxins, chemical agents and so on. And yet, access to the technology which can be misused (AI does what it is supposed to do, but malicious intentions were imbedded in the concept itself), in terms of taking over any all of of mentioned systems, by which false proofs can be forged, which can cause havoc in the transport section, with numerous accidents, has an open access to it.

The question is when it will become a perfect weapon for terrorists, and how that will be stopped. In contrast to today's requirements, when any large scale terrorist act may encompass a need for very rare and specific knowledge (for example in chemistry and/or nuclear physics), and hard to conceal and procure equipment and laboratories, tomorrow's attacks can demand only large(er) amounts of financial resources and more-or-less – generation dependant, available equipment, with real intentions not so hard to present as a purely research work, purposed for general good. Knowledge base, in general, being more and more present and easily at one's disposal. Engaged work force may perform their tasks, even without knowing the real, intended purpose. A preview of potential damage can be seen in (relatively) small, purely, cyber attacks – one can only imagine the havoc which can be wreaked by AI systems misuse. Although the last two items fall out of the scope of this particular article, they should be born in mind and not left in the shadowy corners, created by the blaze of the too obvious clash.

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LANGUAGE MANAGEMENT AND LANGUAGE LAWS IN THE LIGHT OF SOCIOLINGUISTIC DEGLOBALISATION

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ABSTRACT

This paper examines the extent to which language law serves as an instrument of language planning and reflects the specific social, political, and cultural contexts in which it operates. It compares the legislative frameworks of the Republic of Croatia and the Federal Republic of Germany. The analysis applies defined criteria, including the legal status of languages, implementation mechanisms, and regulation of minority languages, to clarify how each framework addresses language planning and management within its respective context. The methodological approach consists of theoretical-comparative analysis, review of legal documents, contextual analysis of legal provisions, and comparative identification of similarities and differences between the two countries' language laws. The study draws on reports from international organisations and relevant research on language legislation. Global pressures, including the dominance of English, migration, and digital globalisation, have positioned language laws as social responses to threats against national and cultural distinctiveness. Using Language Management Theory (LMT) and the sociolinguistics of deglobalisation, this study analyses how states address communication and identity challenges in a multipolar world through language legislation. The analysis considers whether language policy functions not only as an administrative tool but also as a mechanism for preserving cultural sovereignty in a (de)globalised context.

Keywords: *Globalisation, LPP, language law, language management*

1. INTRODUCTION

Language policy, language planning, and normative regulation of language use are central to the identity and cultural policy of European countries. Language laws define national and official languages as elements of state sovereignty and social cohesion, while also mediating tensions between cultural protection and global influences. Specific legal acts prescribe the status and use of official and minority languages, regulate public communication domains, and establish institutional oversight. European examples demonstrate diverse approaches; however, contemporary language laws commonly exclude private communication and protect minority linguistic rights. This study examines language laws and their role in language planning and policy, with the aim of analysing and comparing the status of languages within different legal systems. It examines the influence of language laws on language planning and societal language practices. The analysis focuses on the similarities and differences between the language laws of the Republic of Croatia and the Federal Republic of Germany, as well as the extent to which these legal frameworks reflect the social, political, and cultural specificities of each country. The paper presents a theoretical framework, reviews the development of language policy and planning as a discipline, and defines key concepts, including language planning, language policy, and sociolinguistic deglobalisation. It provides a comparative analysis of language laws in Croatia and Germany, drawing conclusions about the structure of language laws, the legal status of specified languages, and the regulation of minority languages, institutional implementation mechanisms, and legal consequences of violations, all within the socio-political context of each state.

2. SOCIOLINGUISTICS OF DEGLOBALISATION: DEFINITION, CONTEXT, AND CONSEQUENCES

The term deglobalisation refers to the reduction of global connectivity and the return of power to nation-states. In this process, global flows of capital, people, and language slow down or are redirected due to political, security, and cultural pressures (Wallerstein, 2008). In language, this is reframed within the sociolinguistics of deglobalisation. Roche and Kruk (2024) developed this framework in response to the changes in the global order that followed the 2008 financial crisis. They note the world has shifted from liberal globalization to a post-neoliberal epoch, marked by increased state sovereignty, greater control over communication, and redefined language policies (Roche & Kruk, 2024, pp. 902–904). Earlier sociolinguistic research on globalisation emphasized mobility, hybridity, and openness (Blommaert, 2010; Heller, 2011). In contrast, the deglobalisation paradigm highlights state-imposed restrictions and exclusions. Language, previously linked to free movement, is now utilized by states as an instrument for enforcing control and delineating belonging (Khan, 2017; Rampton, Silva & Charalambous, 2024). Roche and Kruk (2024, pp. 905–906) demonstrate how countries such as China, Indonesia, Ethiopia, and Nigeria utilize language laws and educational policies as “muscular expressions of sovereignty”. These measures consolidate political control while simultaneously shaping cultural identity. In such cases, language laws do not protect rights but act as technologies of power, marking who belongs to the political community and who does not. Language policy thus becomes an instrument for governing populations, disciplining diversity, and establishing language hierarchy (Foucault, 2008; Mbembe, 2003). Theoretically, Roche and Kruk (2024, pp. 910–911) support a “dark turn” in sociolinguistics, drawn from anthropology (Ortner, 2016). This approach examines the “dark” side of language politics, including power, dominance, inequality, and oppression. It reveals how states, through their sovereignty, employ linguistic violence, symbolic and institutional, rather than physical. This restricts linguistic freedoms and boosts national homogeneity. Language thus becomes protected: communication is observed and linguistic diversity is seen as a threat to unity (Khan, 2020; Roche and Kruk, 2024).

3. FROM LANGUAGE PLANNING, LANGUAGE POLICY TO LANGUAGE MANAGEMENT

Wright (2016) states that although language planning has a formal origin, it has also evolved into an informal activity as old as language itself, as part of the political-economic processes that shape the distribution of power in society. The term “language planning” was first used by Uriel Weinreich in 1957, after which Einar Haugen (1959) employed it two years later. Herder and Fichte wrote about the role of language in nationalism in the USA, France, Germany, and Britain in the 18th and 19th centuries, stating that language defines the ethnicity of a group. The terminology of language planning has evolved since its inception. The term “language planning” was preceded by the terms “language engineering” (Miller, 1950), “glottopolitics” (Hall, 1951), “language development” (Noss, 1967), and “language regulation” (Gorman, 1973). The term language policy is often used in addition to the term language planning, whereby language policy refers to the goals of language planning and to “language activity with all its aspects, language and speech...a set of rational and mostly institutionalized procedures by which a society influences the language forms of public communication and the formation of the awareness of its participants about these forms”. Language management represents a further conceptual refinement introduced by Jernudd and Neustupný (1987), emphasizing the dynamic processes by which language issues are identified and addressed at both micro and macro levels. Cooper (1989) systematically evaluates twelve foundational definitions of language planning by interrogating three principal questions: Who is engaged in planning, what aspects of language are planned, and for whose benefit is this planning undertaken?

According to Cooper (1989), the principal actors in language planning typically include governmental agencies, statutory bodies, and other organisations vested with public authority to regulate language matters. Nevertheless, Cooper contends that language issues should not be confined solely to authorized institutions, as non-governmental actors may also exert meaningful influence. The targets of language planning encompass language behaviour, including corpus planning, status planning, and language acquisition planning, whereby interventions are often designed for networks of smaller social groups such as ethnic minorities, religious groups, local communities, and educational institutions. Kaplan and Baldauf (1997) define language planning as “a system of ideas, laws, regulations (language policy), rules, attitudes, and practices with the aim of achieving planned changes or preventing them in language use in one or more communities.” This definition encapsulates the multifaceted and intentional nature of language planning processes across diverse sociopolitical contexts.

A central question in language management theory concerns the source of authority to manage language. Spolsky (2009, p. 14) observes that the success of management efforts depends on whether those who intervene possess legitimate authority in the eyes of participants. If a manager (a teacher, parent, or government) lacks perceived legitimacy, their attempts to regulate language behaviour are likely to fail. This perspective aligns with sociological approaches to power and legitimacy, recognising that linguistic norms are socially negotiated rather than simply imposed. Consequently, LMT does not assume that management is always successful or even intentional. Management may be resisted, ignored, or reinterpreted by speakers, reflecting the contested nature of language policy. This understanding challenges the earlier functionalist view of language planning as a straightforward mechanism for solving language problems. Instead, LMT portrays language management as an inherently social, political, and ideological process, one that is as much about negotiation and identity as it is about communication. Spolsky’s reformulation of LMT thus situates language within a complex web of social forces. He explicitly rejects the notion that language policy is an autonomous or purely linguistic domain, insisting instead that it is “the reflex of the social, political, economic, religious, ideological, [and] emotional context” (Spolsky, 2009, p. 8). This statement underscores the interdisciplinary nature of language management, bridging sociolinguistics, anthropology, political science, and education.

3.1. Language Planning in Transition: Ideological, Political, and Global Dimensions

A comparative analysis of language laws and legislative regulation in European countries, based on data from the European Language Monitor, reveals the evolution of language planning as an academic discipline. In its early stages, until the 1960s, theoretical approaches were primarily normative and descriptive in nature. Einar Haugen and Heinz Kloss emphasized language standardization, selection, codification, functional expansion, and societal acceptance. During the decolonization period, planning and scientific approaches were considered solutions to language issues in African and Asian countries. However, Fishman and other sociolinguists observed that European colonial languages maintained a higher social status in education, the economy, and technology, highlighting persistent inequalities in language planning. From the 1970s to the late 1980s, existing theories were critically reassessed, and new models emerged. Confidence in Haugen’s theory declined, as Cobarrubias argued that language planning is inherently political and shaped by competing interests. The rise of critical sociolinguistics, led by Tollefson, Lo Bianco, Ricento, and Hornberger, promoted pluralistic approaches and recognized linguistic diversity as a social value. For example, in 2007, the German government required immigrants seeking family reunification to demonstrate German language proficiency at level A1, sparking parliamentary debate over linguistic assimilation.

In the third phase, from the late twentieth century onward, conflicts between local and supranational languages intensified, particularly after the collapse of the Soviet Union and the subsequent increase in migration. Ricento noted that languages with few speakers are threatened by globalisation, while a small number of world languages dominate media, the economy, and culture. The need to protect language rights and linguistic diversity has become a central concern in language policy. Ethnologue data indicate that 95% of the global population speaks only about one hundred of the world's more than 7,000 languages, underscoring the urgency of preserving linguistic diversity. These historical phases reflect a shift from technical standardization to critical evaluation of social impacts, and then to a contemporary emphasis on language rights, language laws and the preservation of languages.

4. LEGAL AND INSTITUTIONAL DIMENSIONS OF LANGUAGE MANAGEMENT IN EUROPE: THE EFNIL FRAMEWORK

Within the framework of the European Federation of National Institutions for Language (hereinafter referred to as EFNIL), which includes 41 member countries, the international project European Language Monitor (a system for monitoring language policies) was launched in 2003 with the main goal of collecting reliable data on language laws, language policy and language planning in Europe, which since 2009 has been recording and analysing data taking into account the legal framework and its implementation in language planning. According to Kirchmeier (2019), it is a database that enables the monitoring of data on how individual states regulate official languages, minority languages, education, language use in the media, public administration, and digital spaces. The data collection methodology in this system is based on a structured questionnaire as a constantly available web interface that contains the following nine thematic questions: The status of languages spoken in the country and abroad is determined as an official, regional, autochthonous and immigrant language, their legal status and compliance with international conventions; the legal framework provided by the law on language, constitutional status, other relevant regulations as well as language requirements related to citizenship; language status in the primary and secondary education system; which are the languages of instruction and which are offered within the school curriculum; languages that are used in higher education if the languages are taught, but also languages that are used in scientific publications and doctoral theses; which languages are used in the media (press, television, film and music - which languages are used and how they are translated); the languages spoken in the business environment and their legal regulation and which languages are used by companies, which are used when compiling annual reports and on the websites of business entities. Language dissemination refers to the teaching of official languages abroad. Furthermore, the languages spoken in various institutions and bodies dealing with language are listed as a topic, including language organisations in official institutions, non-governmental organisations, as well as publicly funded and private institutions, and the topic of language technologies. The advantage of such a systematic collection and analysis of data is the diachronic approach, which enables insight into the sequence of development of language policies and planning in individual countries over a 10-year period. The data collected by the questionnaire is updated every four years and published publicly in the form of an interactive web interface, which enables the search and comparison of legal provisions through the analysis of similarities and differences of individual laws on language, the status of minority languages, educational systems, media, and technological infrastructure related to language. The research does not refer to data on the linguistic competence of the population or the preservation of endangered languages, but emphasizes the legal and institutional aspects of language planning and language policy.

5. COMPARATIVE MODELS OF LANGUAGE LEGISLATION AND MANAGEMENT IN EUROPE: INSIGHTS FROM THE EUROPEAN LANGUAGE MONITOR

A comparison of different European countries conducted by Kirchmeier (2019) indicates that official languages are regulated at different levels of legislation either by the constitution, special laws, or other legal instruments. This diversity stems from historical circumstances, political traditions, and social needs of individual countries, and at the same time reveals different models of language planning. Furthermore, she states that in some countries, primarily in Central and Eastern Europe, the official language is given a prominent place in the constitution. Croatia, Slovenia, Slovakia, and the Baltic states clearly define the national language as official at the highest legal level. (Constitutions, Languages, Definitions and the European Charter for Regional or Minority Languages.) This defines language not only as a means of communication, but also as a symbol of state identity and sovereignty. The Constitution provides language with strong protection against political changes, ensuring its permanent role in public life and the educational system. In contrast, in countries such as Germany, Denmark, or Greece, the official language is not explicitly defined in the constitution, but its use is regulated through special laws or regulations related to the judiciary, administration, and education. This approach exhibits a pragmatic orientation, as language is viewed primarily as an instrument of the state system's functioning, while its symbolic dimension is less emphasized. However, such flexibility also opens up space for discussions about the need for constitutional recognition, which is particularly evident in the case of German language law. A special group consists of countries with several official languages or strong regional peculiarities, such as Switzerland, Belgium, and the United Kingdom. In these cases, the status of the language is defined by a combination of federal, regional, and special laws. For example, in the United Kingdom, there is no single national language law; instead, special acts, such as the Welsh Language Act and the Gaelic Language (Scotland) Act, guarantee their status in education, public administration, and the media. (Gaelic Language (Scotland) Act 2005). These models reflect the need for a balance between national cohesion and the preservation of linguistic diversity. The choice of the level of legislative regulation is not neutral, but represents an expression of a broader model of language planning. States that write their language into the constitution tend to emphasize the identity dimension and symbolic power of the language, while those that rely on special laws show greater institutional flexibility and focus on practical functions. Multilingual states, on the other hand, use elaborate systems of decentralized legal solutions to ensure a balance between the majority language and the rights of language communities. Based on theoretical insights and available research, the paper continues with an empirical analysis of language laws and planning in two different state contexts: the Republic of Croatia and the Federal Republic of Germany. The selected cases provide insight into two distinct models of language planning: constitutionally regulated official language (Croatia) and the absence of a constitutional provision, accompanied by fragmented regulation (Germany). Such a comparative approach will provide insight into the analysis of how language laws are used as instruments of language planning in various societal domains. The areas covered by the questionnaire include, among others, formal language legislation (existence of laws, official language status), language in higher education, language on company websites, and national support programmes for language technologies. The data has been checked and confirmed by the national language institutions that are members of EFNIL. Special attention is paid to the provision of citations, links, and translations of relevant legislative texts, ensuring a high level of transparency and facilitating further analysis. The availability of structured data on language policy through ELM is a valuable resource for policymakers, scholars, and educators.

A clear and comparative record of legislative instruments enables a deeper understanding and analysis of the dynamics of language regimes in different European contexts. ELM is significantly different from other European language surveys in terms of its comprehensiveness and detail: UNESCO's Survey of World Languages focuses mainly on endangered languages, but does not offer legal sources; Eurobarometers measure public attitudes about language, but have no legal dimensions; while others (e.g. European Survey on Language Competences) analyse educational aspects, but ignore language legislation. (UNESCO's Survey of World Languages).

5.1. Case Study I: The Constitutional Model – Croatia

The Constitution of the Republic of Croatia is the fundamental determinant of the position of the language in the country (Constitution of the Republic of Croatia 1990). The historical foundations of the Constitution state that Croatia is a national state of the Croatian people and a state of numerous national minorities (Serbs, Czechs, Slovaks, Italians, Hungarians, Jews, Germans, Austrians, Ukrainians, Ruthenians, Bosniaks, Slovenes, Montenegrins, Macedonians, Roma, Romanians, Albanians, and others). These minorities are guaranteed equality with citizens of Croatian nationality and the right to preserve and realize their own national characteristics. Article 12 stipulates that the Croatian language and the Latin script are in official use (Article 12). However, in certain units of local self-government, under the conditions prescribed by law, another language and script may be introduced into official use. Article 14 guarantees the rights and freedoms of all persons, regardless of race, gender, language, religion, national origin, or other personal circumstances. Article 15, in particular, emphasizes the equality of members of national minorities and their right to preserve their language, script, and cultural autonomy. For example, the asylum act guarantees the right of asylum seekers and persons under international protection to be informed in a language they understand, including the right to a free interpreter. The law on consumer protection stipulates that products must contain basic information in the Croatian language and Latin script (Croatia - Labelling/Marking Requirements, 2025). The laws on civil procedure and criminal procedure stipulate that Croatian and the Latin alphabet are the official languages in court proceedings, with the possibility of using minority languages when provided for by law. (Law on Use of Languages and Scripts of National Minorities) The law on electronic media stipulates the obligation to broadcast programmes in the Croatian language and Latin script or with translation, while programmes for minorities are exempt and can be broadcast in minority languages (Croatia: Minority languages widely used in education, but too limited in public administration and broadcasting, 2024) the law on audio-visual activities requires that foreign audio-visual content is available in the standard Croatian language or its idioms, while works in minority languages can be shown in the original. The Law on Identity Cards stipulates that forms must be filled out in the Croatian language and the Latin script, with the possibility of bilingual forms for minorities, but with mandatory filling in the Croatian language. The Law on Croatian Citizenship requires knowledge of the Croatian language, the Latin script, and an understanding of Croatian culture and social order as a condition for acquiring citizenship. Furthermore, the Croatian language is prescribed in the Croatian education system as the official language of instruction; however, members of minority groups are allowed to study in their own language through three models (Pre-school, primary and secondary education in the language and script of national minorities). According to Model A, classes are held entirely in the minority language and script, with mandatory learning of the Croatian language. According to Model B, bilingual classes are held, with science subjects in Croatian and social studies in the minority language. In Model C, classes are taught in the Croatian language, with additional classes in minority languages and cultures (2–5 hours per week). Special programmes include summer and winter schools, correspondence courses, and other forms of non-formal education.

As part of the education of foreigners and migrants, preparatory courses in the Croatian language and culture are offered, and special programmes facilitate the inclusion of asylum seekers and individuals under international protection in the regular education system. The institutional framework is provided through the Institute of Croatian Language and Linguistics, which acts as a central public scientific institution responsible for the systematic care of the Croatian language, standard, and dialects (Institute of Croatian Language and Linguistics, 2023). Over the past few decades, several proposals have been made for the establishment of special bodies to coordinate language policy; however, they have not been implemented in practice. Only with the adoption of the Croatian Language Act (2024) was a clearer institutional framework established; the establishment of the Croatian Language Council and the adoption of the National Language Policy Plan are now foreseen (Minister: Law on Croatian language ensures systematic care for language, 2023). The legal framework of the Republic of Croatia features a layered and elaborate system of language regulation, as the Croatian language is constitutionally defined as official. The rights of minority languages are ensured by constitutional law and special laws. Language rights encompass the use of language in both public and private spheres, including education, media, and cultural autonomy. The new Act on the Croatian Language (2024) introduced an additional dimension to the institutional care of the language, clearly positioning it as a cultural asset and an important instrument of language policy (Minister: Law on Croatian language ensures systematic care for language, 2024). Taking into account the new law passed in 2024, Croatia has ensured the formal and institutional status of its language in the European context. Unlike Germany, which approaches the issue of language in a pragmatic and decentralised manner, Croatia has defined language as a cultural and political good, institutionally organized its protection, and opened space for digital development.

5.2. Case Study II: The Pragmatic Model – Germany

Germany occupies a unique position in the European context because it lacks a single law on language or a constitutional provision that explicitly defines the official language. (German language in the Basic Law) The Basic Law (Grundgesetz) specifies the language only in Article 3, and the legal status of the German language is regulated only at the level of individual laws (Basic Law for the Federal Republic of Germany). Thus, the Law on Administrative Procedure stipulates that public administration uses the German language, while the Law on Courts specifies German as the language of court proceedings. However, these are partial provisions that are not constitutionally based. There are three historically and politically determined reasons for this solution. First, considering the number of speakers of the German language, its dominant position is considered self-evident, so it is not considered necessary for additional constitutional strengthening. Second, experiences from the era of National Socialism, when the language was ideologically instrumentalized and abused, made any form of formalized language policy that could resemble the purification or promotion of the language politically unacceptable after 1945. Third, due to the federal structure of Germany, cultural and educational issues are the responsibility of the provinces (Länder), which makes it impossible to have a unified national language policy. The German model is often described as a form of non-normative policy, which is based on minimal legislative interference. Such a point of view is also visible in the public: the majority of citizens believe that the German language does not need to be legally protected from external influences. The exception is autochthonous minorities, whose languages enjoy special protection, primarily based on international instruments such as the Framework Convention for the Protection of National Minorities and the European Charter for Regional or Minority Languages, which Germany has ratified. (Framework Convention for the Protection of National Minorities, 1994)

The implementation of these documents was transferred to the provinces. For example, in 2004, the Law on the Frisian language was passed in Schleswig-Holstein, while in the eastern provinces, the use of the Lusatian Serbian language in court proceedings was ensured. (Friesisch-Gesetz, 2004). In the German corpus planning segment, the only significant regulation concerns spelling. Following the 1996 spelling reform, the Council for German Spelling (Rat für deutsche Rechtschreibung) was established, a supranational body that coordinates changes and harmonizes spelling rules across all German-speaking countries (Language reform simplifies German, 1996). Apart from spelling, grammar, and lexis, they are not subject to official standardisation. Special emphasis is placed on the linguistic integration of immigrants. The Immigration Act (Zuwanderungsgesetz, 2004) foresees the organisation of integration courses that include learning the German language, as well as becoming familiar with the legal system, culture, and history (Immigration Law (2005)). In certain cases, there is also an obligation to attend classes, which confirms that knowledge of the language is considered a key prerequisite for successful integration and participation in society. At the same time, there is a debate in schools about whether to utilize students' bilingual resources or to insist on the exclusive use of the German language, where the dominance is often on the side of the monolingual approach. Unlike autochthonous minorities, the languages of immigrants (e.g. Turkish) do not have systematic institutional support. Teaching of the mother tongue is organised only occasionally and without a unified national framework. The prevailing view is that integration is conditional on mastering the German language, while languages of origin are often perceived as an obstacle to inclusion in society. In conclusion, German language policy is characterized by the absence of constitutional regulation, partial legal provisions, a strong emphasis on the integration role of the German language for immigrants, and the protection of indigenous minority languages through international obligations (The German Language and the Constitution). Such a model is the result of historical experiences, the federal structure, and the social belief that the position of the German language does not require further strengthening through legislation.

6. CONCLUSION

The development of theories and models of language planning is closely related to social changes that shape the linguistic needs of individual communities. Instead of weakening, the need for language planning is increasing due to three processes: globalisation, migration, and the creation of new states and state unions. Globalisation leads to more intensive language contacts and the spread of languages that have an international function, but at the same time, it raises the question of preserving smaller languages and maintaining a balance between communicative efficiency and linguistic diversity. Migration affects the structure of the population and sets requirements regarding integration and learning the official language, while simultaneously opening space for the preservation of the languages of minority groups. The creation of new states and supranational communities encourages the formation of language policies that must take into account the multi-layered identity and multilingualism of such communities. Considering these circumstances, it can be expected that existing models of language planning will be gradually adapted, and new approaches will emerge that correspond to the current needs of society. However, deglobalisation as a global shift stems from crises in neoliberalism and increasing insecurities, which in turn strengthen state authority and identity (Roche and Kruk 2024). As deglobalisation develops, language is transformed from a neutral medium into a contested arena for asserting national interests and norms, central to understanding broader cultural and political changes for protecting the national language with legislation. These consequences support the central argument. Firstly, the states recentralise linguistic power by establishing restrictive norms and limiting linguistic diversity.

Secondly, symbolic violence against minority languages intensifies, diminishing their institutional representation. Third, sociolinguistic research must transition from a neutral standpoint to engagement, acknowledging the political dimensions of language (Roche and Kruk, 2024, pp. 913–914). The sociolinguistics of deglobalisation demonstrates that language functions as more than a means of communication; it serves as a mechanism for shaping social power and resistance. States employ language through legislation, education, and ideology to regulate diversity, construct identity, and preserve social order. Contemporary sociolinguistics therefore investigates not only language flows but also the boundaries, surveillance practices, and silences characteristic of a deglobalised context. The activities of EFNIL and the European Language Monitor project show that language issues in the European context are not left exclusively to national legislation, but form part of a wider network of international cooperation and data exchange. (European Languages in the Public Sphere (ELIPS)) In this way, a comparative analysis is made possible, revealing different approaches to the legislative regulation of language status, the position of minority language communities, and the role of educational policies. The results of comparing two different language policy models demonstrate that the legal framework of language laws reflects the specific social, political, and cultural contexts in which they operate. Thus, in the case where legal provisions on language do not exist, but regulation is based on individual laws and international conventions, it reflects the federal structure and historical sensitivity to language normativity. In contrast, there is an elaborate system in which the official language is prescribed by the Constitution, and the new Act on the Croatian Language from 2024 establishes additional mechanisms for (technological) development. This comparative analysis confirms that language laws do not act solely as normative acts, but rather reflect the political system, historical experiences, and cultural values of the societies in which they operate.

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