

# PROCEEDINGS BOOK

## CHALLENGES OF DIGITALIZATION IN THE BUSINESS WORLD



Proceedings Book from  
Second International Scientific Conference  
"Challenges of Digitalization in the Business World"



Belgrade, November 23<sup>rd</sup>, 2023

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**ALFA BK UNIVERSITY**  
**Belgrade, 2024.**

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BELGRADE**

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"Challenges of Digitalization in the Business World"  
Belgrade, November 23rd, 2023**

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**ALFA BK UNIVERSITY**

Belgrade, 2024

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## ***FOREWORD***

The Second International Scientific Conference "Challenges of Digitalization in the Business World", is held in organization of Alfa BK University, Faculty of Finance, Banking and Auditing, in co-operation with its partner institutions on the Project U 01/2023 GREEN ECONOMY IN THE ERA OF DIGITALIZATION, as well as with its following co-organising partner organizations: Institute for International Politics and Economics from Belgrade, Institute for Agricultural Economics from Belgrade, Institute for European Studies from Belgrade, Faculty of Hotel Management and Tourism from Vrnjačka Banja, University of Kragujevac, Faculty of Business Studies and Law of the MB University from Belgrade, the Faculty of Mediterranean Business Studies Tivat of the "Adriatic" University from Bar, Montenegro, Burgas Free University from Burgas, Bulgaria, Faculty of Commercial and Business Sciences, Celje, Slovenia, CEATM (Building bridges between Slovenia, Western Balkan and the World), National Academy of Public Administration of the Republic of Serbia, Scientific Society of Serbia for Accounting and Auditing and Institute of Economics and Finance, Belgrade, held on November 23th, 2023. The conference was being held in a hybrid format, in vivo and through an online platform.

The conference was participated by more than 45 authors from more than 10 countries with over 27 papers, most of which come from the University's partner scientific research organizations, while some of them from Alfa BK University, Faculty of Finance, Banking and Auditing, Belgrade, Serbia; Department of International Economic Relations and Business, University of National and World Economy, Sofia, Bulgaria; A&F University, China; Faculty of Commerce and Management and Studies, University of Kelaniya, Sri Lanka; Universite Cote D'Azur, Nice, France; Faculty of Economics and Business, Universitas Indonesia; Institute of Economics RAS, Moscow, Russia; CFA, FRM, CAIA, United Kingdom; Faculty of the Novosibirsk State University of Economics and Management, Novosibirsk, Russia; Burgas Free University, Burgas, Bulgaria; Josip Juraj Strossmayer University of Osijek - Faculty of Tourism and Rural Development, Croatia; Institute for International Politics and Economics from Belgrade, Serbia; Institute for Agricultural Economics from Belgrade; Institute for European Studies from Belgrade, Serbia; Faculty of Hotel Management and Tourism

from Vrnjačka Banja, University of Kragujevac; Faculty of Business Studies and Law of the MB University from Belgrade, Serbia; BAPUSS, Belgrade Academy for Business and Art Vocational Studies; Modern Business School, Belgrade, Serbia; and College of Service Business, East Sarajevo-Sokolac, Bosnia and Herzegovina.

The conference was opened by PhD, Marijana Joksimović, Full time Professor, Senior Research Associate, President of the Scientific Committee, Alfa BK University, Faculty of Finance, Banking and Auditing; PhD, Suzana Balaban, Assistant Professor, Vice Rector Alfa BK University, and PhD, Jozefina Beke-Trivunac, Full time Professor, Emeritus, Research Associate, Vice president of Scientific Committee, Alfa BK University, Faculty of Finance, Banking and Auditing, Director of the Institute for Strategic Studies and Development "Petar Karic", Belgrade.

In addition to plenary lectures by invitation in a role of our guests, papers were presented in several thematic sections depending on their topic. The Proceedings Book, presented and derived from this Scientific Conference articles and presentations, represents the results of research conducted by the Project U 01/2023 GREEN ECONOMY IN THE ERA OF DIGITALIZATION participants on the contemporary Challenges of Digitalization in the Business World, considered from different aspects and current streams of modern science on economics, law, agriculture and other fields of social sciences and their nexus to information technologies and digitalization issues.

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## PLENARY LECTURES/PREDAVANJA PO POZIVU

### TRANSFORMATION OF THE INTERNATIONAL BUSINESS TRANSACTIONS IN THE ERA OF SUSTAINABLE DEVELOPMENT AND DIGITALIZATION

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**Abstract:** *International business in all its forms is extremely important for the economy of all the countries in the world. In recent decades its imperatives have been related to achieving economic growth through sustainable development. Integrating digital technology into all areas results in fundamental changes in the way businesses operate and deliver value to customers, while increasing their competitiveness.*

*The diversification of the forms of international business leads to complex transactions for technology transfer, global outsourcing, offset operations, large-scale investment projects, various types of public-private partnerships, as well as new directions in business, for example, green business, e-business, etc. Modern forms of international business such as franchising, foreign direct investments, public-private partnerships, etc. undergo some modifications in the context of environmental concerns. New financial instruments, e.g., green, and blue bonds have been developed. Green banks are working on the financial market, rules are*

*being introduced for financing green investment projects, etc. Traditional forms such as international sales of goods or supply chains are also changing under the influence of sustainable development and digitalization.*

*This paper is dedicated to changes and trends of various forms of international business under the influence of environmental protection goals and digital achievements. It presents a holistic framework of the transformation of international business operations. The paper examines the role of green finance as well. A scientific and at the same time practically oriented approach through desk research and case studies is applied in the evaluation of the implementation of modern formats of international business.*

**Keywords:** *digitalization, environmental protection, green bonds, green forms of international business.*

## INTRODUCTION

Unique economic, political, and social factors influenced the dynamic changes in international business. The world looks different after the recent COVID-19 pandemic, energy crisis, military conflicts, and climate changes. Alterations in the international environment have led to certain transformations in traditional business operations.

Speeding up of digitization and the green agenda became the new highlights of international business. The coronavirus disaster acted as an accelerator of digitization. It has given impetus to e-commerce, e-banking, working from home, online education, remote medical assistance, etc., which require wider use of online activities. The implications of globalization for companies include not only the diversification of international business worldwide and the strengthening of new modes such as e-business, but also other evolving views of the environment in the form of "green business" and new attitudes towards renewable and alternative energy sources. The obligations are grouped around three areas: providing a favourable environment by improving connectivity and promoting entrepreneurship, increasing learning and innovation by public and private actors, including increasing enrolment in education, employing more researchers and investing more in research and development and transferring knowledge across borders by expanding foreign direct investment in research and development activities, strengthening online learning and increasing international cooperation.

One of the positive effects of COVID-19 is that it has caused the "greening" of business, e.g., "green" products, "green" energy, "green" supply chains, "green" transport, etc. (Vassileva, Simić, 2021). Care for the environment

and a strong focus on sustainable development inevitably affect many forms of international business. Transformations have been observed in almost all international affairs, dictated by the necessity of nature protection. The green economy agenda promotes sustainable patterns of production and consumption - efficient resources and energy, low carbon and waste emissions, non-polluting, safe, and climate-resistant, gradual elimination of toxic substances, use of renewable energy sources, assuming greater responsibility of producers and reducing overall risks. The crisis has opened a huge opportunity to use it as a moment of reboot for the world and as a chance for the corporate sector to take the lead and embrace sustainability as a strategy for its own success and as a global goal. It has forced consumers to reassess their needs and lifestyles and allows for a potential acceleration of the green agenda. For example, in the automotive sector, despite the drop in demand for new vehicles, the impact of the pandemic on demand for electric vehicles appears to be much more environmentally friendly. This also has a positive impact on the outlook for the recovery of the battery supply chain. Overall, the pandemic has increased awareness of the benefits of the digital and green transition, which should be linked to adequate investments and political incentives (de Vet et al., 2021).

As many countries turn to debt to help finance the recovery from the coronavirus pandemic and the other crises, a growing number of governments, municipalities and companies are looking for financial instruments focused on sustainability. A key part of the green finance which allows to manage better environmental and social risks, to take up opportunities that bring both a decent rate of return and environmental benefit, are the green bonds. Recently countries like Germany, Sweden, Hungary, Serbia, and Egypt have launched green bonds to help their economies. (Vassileva, 2022a).

## **1. METHODOLOGY OF THE RESEARCH**

This research has been made within the frames of the project U 01/2023 "Green economy in the era of digitalization" carried out by Alfa BK University, Belgrade. Its purpose is to analyse the basic transformations in international business transactions because of sustainable development and digitalization. A new view of resources is noticed in trading with green products and participating in projects for implementation of renewable and alternative energy sources. The environmental concerns and the digital innovations inevitably lead to the remodelling of the international business

transactions. The analysis is dedicated to the modifications in the formats of green business. This paper reviews the assumptive conceptualization process based on empirical evidence obtained through qualitative, illustrative, and descriptive analysis methods. Through the collection and qualitative content analysis of milestone papers and case studies, it demonstrates the evolving nature of green business transactions. Data from scientific literature, international organizations (UN, WB, EC, EIB etc.), and companies' official websites have been used. The case study approach employed in the current study represents grounded theory and inductive methodology. The rationale for using multiple cases is to reveal varying perspectives on the same subject. As part of the present project, we carried out a series of meetings and interviews with executive directors of companies in Bulgaria and Serbia, the results of which will be published in the follow up papers. The findings confirm that the changes go together with digital innovations.

## **2. RESULTS AND DISCUSSION**

### **2.1. Transformations in international business in the era of sustainable development and digitalization**

In recent decades, various business operations, which contribute to economic growth and a high standard of living have come to the fore when achieving economic prosperity through sustainable development and digitalization. This new "green" economic direction, as well as the actions and measures taken at the national and international level, for the protection of nature and its resources, inevitably ensure its influence on international business. In almost all international affairs, changes that are dictated by the desire to protect nature and human health have been observed. The coronavirus crisis has also enhanced the development of green supply chains. Humanitarian supply chains connected with the trade of medical appliances and pharmaceuticals have also expanded.

#### *New products as subject of international business*

As a result of the green policy new products appear in international business such as waste, biofuels, carbon emissions, natural green products such as foodstuffs, pharmaceuticals, cosmetic products, clothes, green energy, new high-tech products of digital medicine, etc.

Waste has recently become a subject of many investment projects of the green cities and municipalities. The waste management policy of the European Union is based on the Framework Directive on waste management,

on Regulation 1013/2006/EC on the monitoring and control of waste shipments, as well as on many other directives that regulate activities with different waste streams. There is also a hierarchy of waste, which must be respected in their treatment: prevention, preparation for reuse, recycling, other use (e.g., for energy) and disposal. In the context of this EU policy to reduce the harmful effects of waste on the environment, many business opportunities have emerged. Business entities begin to implement existing operations in a new way, and to modify them so that they meet the requirements of the law. New business opportunities arise for companies - they can expand their activities, entering a new sector such as environmental protection; new companies or departments of existing ones are created that deal only with activities related to the collection and treatment of waste (Boeva et al., 2015).

#### *Green procurements*

Environmentally friendly ("green") are the public procurements that are carried out according to a procedure where environmental considerations are taken into account in the procurement process. When awarding such type of procurements, materials and energy can be saved through rational use of natural resources and reduction of the amount of waste generated while bearing in mind the entire life cycle of the products.

European administration spends annually the equivalent of 17% of the EU's gross domestic product to purchase goods, above all in sectors with a relatively high impact on the environment (EC, 2016). Given the economic importance of public procurement, they can use it as a tool for engagement on a national scale for production of goods and services with higher ecological efficiency. This type of procedure leads to the limitation of pollution and damage to the environment, as well as to the reduction of the costs that the society must make for the removal of these harmful effects and their consequences.

Another motivation for forcing the green public procurements is that they set the trends in new product development, production, and consumption, and thus help the established already markets to convert. In the following years, public procurements are a strong factor in creating the main market for green products - stationery, clothing, furniture, hospital supplies, electrical cars, or other vehicles (e.g., hydrogen cars), organic food, etc. As a result, new products, standards, and business models emerge.

#### *Green PPPs*

In a broader sense, PPP covers the whole range of cooperation between the public and private sectors. Any relationship involving some combination of private and non-governmental or public sector activities is defined as a 'partnership'. This broader framework includes partnerships at "policy level" and at "project level", especially with regard to initiatives related to environmental protection and the achievement of economic growth through sustainable development to meet the goals of the green economy (Vassileva, 2022b). The policy-level partnerships combine the efforts of the public and private sectors in project decision-making and policy formulation. In the field of energy, for example, policy-level partnerships assess the benefits of different types of energy sources, including renewables, basic operating rules, investment instruments and dispute resolution. In contrast, the partnerships at project level focus on specific sites, such as building of hospitals, housing and urban development or the construction of new electric power stations to attract private capital and ensure stable project management. In some countries, partnerships at policy, program and project level often go hand in hand, in others - this is not always the case (UN, 2016). The spectrum of organizational and management forms, financing methods and technological innovations in PPP is extremely rich.

### *Green franchising*

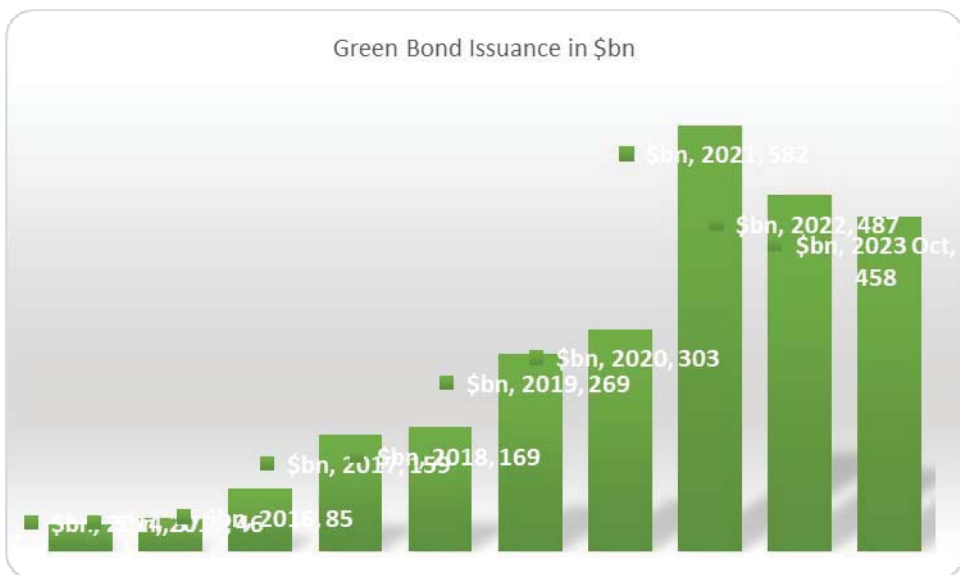
Franchising has become a common practice in many sectors of modern economy. Most common in international green business is system franchising (format franchising). In this type of agreement, the franchisor transfers to the franchisee the entire business model, including production and marketing methods, sales systems, procedures, and management know-how, as well as the use of his name and rights to use of goods, patents, and commercial brands (Vasileva, 2011). The franchisee provides to the franchisor training, ongoing support, programs for incentive and the right to participate in co-local marketing programs. It may be necessary for the franchisee to buy equipment and materials from the franchisor to ensure standardized products and uniformity of quality.

The fact that the franchisor strictly controls the business system to guarantee the customer uniform standards, same services, and product quality makes it a suitable form of environmentally friendly business, especially in providing hospitality services in hotels, restaurants, beauty studios, medical tourism, etc. Green franchising is becoming more and more popular in construction, e.g., building smart buildings, green cities, manufacturing of eco-brands in textile industry, etc.

## 2.2. Green bonds as a new financial instrument

Green bonds are a relatively new debt instrument earmarked to finance projects towards the green transition. The World Bank defines green bonds as “a debt security that is issued to raise capital specifically to support climate-related or environmental projects” (WB, 2015). Since the first green bond was issued by the European Investment Bank in 2007 the market value as of the beginning of October 2023 of the green bond universe has grown to 2.334bn US Dollars, according to the Climate Bond Initiative (CBI) - a non-for-profit international organization that is “working to mobilise global capital for climate action”. (Initiative, 2023) (EIB, n.d.). The following graph demonstrates the exceptional growth of the green bond market up to mid-October 2023.

**Figure 1.** Green bond market



Source: Climate Bonds Initiative - <https://www.climatebonds.net/> , Authors calculations

In the period since 2007, the green bond market has also expanded to energy companies. (Reichelt, 03 May 2018) The growth of the green bond market has also spurred the major bond exchanges to create space for those new instruments. For example, “The London Stock Exchange (LSE) included a green bonds list in 2015, and the LuxSE launched the Luxembourg Green Exchange (LGX) in 2016” (Lin, 2023).



An ongoing issue in the green bonds market is the 'greenwashing'. The Oxford Institute of Energy has defined: 'Greenwashing' is the practice of companies giving a false impression of their environmental impact or benefits. Greenwashing misleads market actors and does not give due advantage to those companies that are making the effort to green their products and activities." (Maino, February 2022) Investors who buy green bonds tend to keep them until maturity, as the cost associated with reviewing the compatibility with internal or external compliance with ESG standards of new holdings will outweigh any price benefits. This leads to low liquidity in the secondary market (buy-and-hold, because of impact reports and integration into the ESG programme of the buyer) (Reichelt, 03 May 2018)

The Green Bond Principles (GBP) published by the International Capital Market Association (ICMA) were first established in 2014 as "Voluntary best practice guidelines" (CBI, n.d.). Ever since, ICMA has been updating their GBPs to keep up with the development of the market. Currently the June 2021 edition with a June 2022 Appendix 1 is relevant for the market participants. According to the GBP "Green Bonds are any type of bond instrument where the proceeds or an equivalent amount will be exclusively applied to finance or refinance, in part or in full, new and/or existing eligible Green Projects and which are aligned with the four core components of the Green Bond Principles". The four core components are: Use of Proceeds, Process for Project Evaluation and Selection, Management of Proceeds, and Reporting.

A new development in establishing framework is the European green bond standard. On 14<sup>th</sup> of January 2020, it was announced that "the Commission would establish an EU green bond standard (EUGBS)" (Commission, n.d.). A political agreement for the EU Green Bond Standard was reached on 28<sup>th</sup> of February 2023. There were also a vast number of local regulatory initiatives around the globe. Examples include ASEAN Taxonomy for Sustainable Finance, IPSF Common Ground Taxonomy (Hong Kong), The Green Bonds Endorsed Project Catalogue (China), Russian National Taxonomy for Green Projects, Mongolian Green Taxonomy, Climate Change and Principle-Based Taxonomy (Malaysia) etc. (Initiative, n.d.)

The existence of a premium paid by investors for obtaining a green bond has been coined as "greenium". The existence of such a premium is widely discussed and the findings have been mixed. For example, as early as 2018 Guy Van Syckle, a CFA Charterholder from Hannon Armstrong, a company that invests about 1bn USD per year in wind and Solar farms, and issues green bonds and notes concluded that there is no greenium at the time

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(Reichelt, 03 May 2018). Furthermore, the Bank for International Settlements research showed that the “[e]vidence from both primary and secondary markets points to a small and negative yield premium (“greenium”)” (Ingo Fender, March 2020). The work of Yun Gao and Jochen M. Schmittmann has shown that “green bonds have a price premium over conventional bonds when there is information asymmetry, transition risk, and it is costly to engage in greenwashing, that is, false or exaggerated claims of being green”. (Gao, December 2022)

Green bonds are recent debt instruments, which are helping companies, investors and international organizations align themselves with the Sustainability Principles and help support climate-related, or environmental projects. As seen the market had grown substantially and new frameworks have been developed to evaluate the “greenest” of the green bonds. There is surely potential for more companies and investors to look into the Green Bonds market to showcase their commitment to sustainability and for the green transition.

### **3. GOOD PRACTICES**

*Case 1. Green business and high technologies go together: the case of Josef Göbel GmbH, Austria.*

The finest craftsmanship and the most modern high-tech are combined by the carpentry business “Josef Göbel” from Fladnitz in the Almenland, Austria, which exports worldwide, inspired by a visionary manager who prefers to combine revolution with tradition. The current large-scale investment at the Styrian location is leading the company into a new era and is delighting customers from all over Europe.

Founded by Edmund Göbel in 1874, the company today has 300 employees and annual revenues of 40 million EUR (Schrober, 2019). Josef Göbel is a family enterprise based on the principles of sustainability and new technologies. From family values to craftsmanship, the combined knowledge of almost 150 years has been passed on from generation to generation.

The exclusivity of the work by "Josef Göbel" is demonstrated by the unique interior of the spacious meeting room in the company headquarters. The equipment, the glass, the doors, windows, and leather walls - everything comes from the company. The generous view from the conference table of alpine meadows, including cows and deer, is also impressive. A scenery with added value.

The company's open-mindedness is not only mirrored in the latest technologies but also in its international activities, that have become more and more important. "In the 1990s, we started entering global markets, especially in Eastern European countries," sums up Mr. Göbel. "Today, exports make up 60 to 70% of sales; we cover 18 different countries from Portugal to Russia. We simply follow customers." Josef Göbel's wooden products are highly demanded by private customers, embassies, pharmacies, flagship stores or hotels. They appreciate the company's quality and service-driven philosophy. "The Fladnitz location would not have been sustainable without a broadband connection. A data transfer as we need it cannot be managed with a copper cable as before. Our customers send us digital plans from half the world, we're talking about many gigabytes of data. We therefore need cables with enormously high performance", he emphasizes. An important company principle is: "If it were easy, everyone would do it. "This means that no matter what ideas the client comes to us with, we have high-quality solutions for the trickiest tasks and always try to think "outside the box". We are proving that again with the current investment. It's about bringing people and robot technology closer together and paving the way for "Handwerk 4.0", says the owner (Schrober, 2019).

The management adapts to digitization and that has a huge impact on their business. Their aim is to grow with new market challenges. To further enhance performances and improve quality, they are going to revamp their production facilities. At the same time, they are aware that qualified employees are crucial to keep up high quality standards. For this reason, they continue investing in trainings and intensify partnerships with schools and universities.

As a family business that has existed since 1874, every investment is considered very carefully. The company has set up clean financing with the help of their bank and many funding opportunities. The latest extension the company makes is a major ecological investment. 800kW photovoltaic systems are installed on the roofs, this will enable the factory to cover almost 50% of their electricity needs by themselves in the future. The entire hall lighting is switched to LED. The heating is already running with their own biomass, which supplies the whole of the village of Fladnitz. Especially for them as carpenters, the ecology with their wonderful natural material is becoming more and more important. A way of thinking that is also due to their natural surroundings, the Almenland.

*Case 2. How to achieve "green" global success based on tradition and new technologies? The case of Corticeira Amorim, Portugal.*

Corticeira Amorim S.G.P.S., S.A., is a Portuguese company belonging to the Amorim Group which is the world leader in the cork industry for over 150 years, with operations in hundreds of countries all over the world. Corticeira Amorim is responsible for the management of 70 companies engaged in the cork manufacture, research, development, promotion and sale of products and new solutions for the cork industry. Organized in five business divisions – Raw-Materials, Cork Stoppers, Floor & Wall Coverings, Composite Cork, and Insulation Cork – Corticeira Amorim sells an array of products largely to such industries as the aeronautical, construction and wine-producing industries; a result of the investment made in R&D. In the Raw Materials division, the Company is active in the purchase, storage, and initial preparation of cork. The Cork Stoppers division produces and supplies various types of bottle caps, mainly for the wine industry. The Coverings division is active in the production of cork-based laminates. The Cork Composites and the Isolations units produce thermal, acoustic, and anti-vibration insulation products, among others. The Company and its subsidiaries operate in Portugal, Spain, Tunisia, the United States, Australia, Germany, China, Italy, Argentina, France, and Netherlands, among others. Amorim's holding company is listed on the Euronext Lisbon stock exchange ([www.amorim.com](http://www.amorim.com)).

The company's policy of sustainability follows the principle "people, planet, prosperity". Its managerial, environmental, and social aspects are aligned not only with the company's values and mission, but also with its commitment to stakeholders and to the UN sustainable development goals (SDGs). Implementation is achieved through the involvement of top management and the teams responsible for realization of sustainability initiatives in view of the commitment and ambition,

Cork lies at the heart of Corticeira Amorim's business. Cork, as a 100% natural, renewable, recyclable, and reusable product, is an excellent alternative to reduce global dependence on non-renewable products. The company is committed to ensuring that its business activity has a positive impact on ecosystems, throughout its green value chain, with an activity based on the bioeconomy, renewable materials, and the search for zero waste. Cork oak forests are important natural carbon sinks, and regulate the hydrological cycle, protect against erosion and fire, and foster biodiversity on a par with regions such as the Amazon rainforest, Borneo or the African Savanna.

Over the years, Corticeira Amorim has been increasingly concerned with optimising processes and implementing new technologies, that promote and improve energy performance, namely investing in energy efficiency measures and the renewal of ISO 50001 management system certifications in various of the Group's business units. The main energy source consumed by Corticeira Amorim is biomass, primarily cork powder, which is endogenous and 100% renewable. Use of cork powder makes it possible to take advantage of the waste that results from manufacturing cork products and helps reduce CO2 emissions.

One of the cornerstones of Corticeira Amorim's business activity is to implement circular economy principles. The combination of cork with waste from a wide range of industries, has engendered a panoply of new products, solutions and applications focused mainly on reduction of waste generation and promotion of its recovery ([www.amorim.com](http://www.amorim.com)).

*Case 3. Creation and development of systems and applications in the field of digital medicine: The "Digital Medicine" public – private project, Bulgaria*

The Digital Medicine Consortium was established by the Faculty of Medicine at Sofia University "St. Kliment Ohridski" as a leading partner with 60% participation share and "Alliance Medica Capital" OOD, specialized in digital transformation and robotics with 40%. Sofia University "St. Kliment Ohridski" is the first and the largest Bulgarian higher education institution with 119 specialties in the field of humanitarian and natural sciences. The university contributes to the world development of science and education and plays an active role in the design and implementation of policies of national, regional, and international importance. Alliance Medica Capital OOD (AMC) implements projects in the field of R&D with artificial intelligence (AI), robotics, green energy, incl. hydrogen power and Industry 4.0 guidelines. AMC is focused on the analysis and implementation of complete solutions in Industry 4.0 and decarbonization of enterprises in industry and energy. Taking advantage of its experience and expertise, it is striving to be one of the first in the design and application of new technological solutions in digital medicine projects ([alliance-medica.net](http://alliance-medica.net)).

The purpose of the Consortium is to take part in the development of projects, programs, and products in the field of research and innovation related to new applications and systems for digital medicine, improving efficiency, and introducing new solutions with a view to the digital transformation of the sector, and increasing the quality of healthcare according to European standards. The implementation of the project aims to achieve elevating the

quality of accurate diagnostics by introducing artificial intelligence and visualization, facilitation of specialists in providing hospital and pre-hospital care by providing access to unified registers of patients in one of the riskiest groups - oncology and transplantation, improving the speed and quality of service to patients in risk groups, providing an opportunity to increase the qualifications of students and medical specialists in the field of digital medicine, import of modern technologies and implementation of new products and systems using the experience of leading European countries, and increasing the level of service and the quality of healthcare in the Republic of Bulgaria.

The activities that have been planned include: creating a project for 3D visualization from image diagnostics based on artificial intelligence, creation of a project for the integration of the Republic of Bulgaria in various transplant programs in the EU, development of a concept and creation of a unified registry for cancer treatment and good practices in oncology, development of a project to increase the level of paediatric healthcare in Bulgaria, including construction of new facilities, construction of a pilot project for a digital hospital /smart hospital/ and development and implementation of projects in the field of digital medicine. One of the final goals of the project is the creation of master's programs at the Faculty of Medicine of Sofia University "St. Kliment Ohridski" in the field of digital medicine and transplant ology, jointly with French universities.

Another important goal is creating a project for 3D visualization from imaging diagnostics based on artificial intelligence. The project envisages the creation and adaptation of training applications and the adaptation of AI models to medical imaging equipment, creating an AI computing platform for medical devices that combines sensor hardware systems with cloud connectivity, optimized data processing libraries and AI to run streaming, imaging, and other applications. It encompasses 3D volumetric interactive visualization that allows medical professionals, scientists, and researchers to visualize and interact with massive data sets, make real-time modifications, and navigate to the most relevant parts of the data.

Expected results of the implementation of the planned activities are: improving the health status of patients and facilitating preventive medicine, import of modern facilities and equipment, faster and better service to patients will lead to an increase in their satisfaction and trust in the health care system, reducing the costs of medical services and medicines in view of the faster and better treatment of patients from risk groups, minimization of life-support activities in patients awaiting transplants, improving the

qualification of doctors and achieving European standards of treatment and technical equipment of hospitals will increase the image and attractiveness of the state for Bulgarian and foreign citizens. One of the major results will be elaboration of a pilot project for a digital hospital /smart hospital/(alliance-medica.net).

## CONCLUSION

The changes in international environment in the recent years cause "green" transformations of the business operations using also new financial instruments. Remodelling in business goes hand in hand with the policy of managing green and digital transitions in the European Union. There is a broad consensus on the priorities of the country members, which includes green and digital transitions and the need to enhance the Union's economic and social resilience. The welfare effects of digitalisation and decarbonisation are likely to be unequally distributed in the absence of accompanying measures. Labour reallocation within and between sectors require reforms and large-scale investment in reskilling and upskilling. A strong policy response at all levels is needed to effectively address the social and cohesion challenges.

Therefore, Europe's growth model needs a strong social dimension that focuses on jobs and skills for the future and paves the way for a fair and inclusive transition. At EU level, the European Pillar of Social Rights and the associated Action Plan provide a coherent framework for action. The EU budget and NextGenerationEU is providing support to reduce regional and social disparities through cohesion policy, the Just Transition Mechanism, the Recovery and Resilience Facility and, in the future, from the proposed Social Climate Fund. The assistance of the EU for the companies to go green is a subject of future examination.

Reaching the common goals requires a long-term vision and a coordinated approach in financing the green business. The ambitious green, digital and resilience targets the EU has set can only be achieved by a sustained effort involving all actors at European member states and company level.

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## FROM FIELD TO MARKET: DIGITALIZATION AS THE KEY TO BUILDING ENTIRE AGRICULTURAL VALUE CHAINS IN RURAL AREAS

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**Abstract:** *This paper explores a novel approach to integrated rural development: constructing entire value chains in rural areas. While integrated rural development has a strong theoretical foundation, past practical attempts have often fallen short. In contrast, this new concept, involving the establishment of secondary and tertiary sectors in rural areas, lacks a formal theoretical basis but is being implemented through China's recent agrarian policies. The implementation of this concept was made possible exclusively by the development of Information and Communication Technology (ICT) and mass digitalization. The research aims to identify and categorize obstacles to previous integrated rural development programs, assess how digitalization can overcome these challenges, and explore the potential of digitalization in creating rural value chains. The methodology involves content analysis of primary and secondary data, comparing and classifying implementation challenges, and examining how digitalization can address these issues. The findings demonstrate that digitalization offers solutions to all identified obstacles. Today, every stage in the field-to-market supply chain can benefit from digital support, bridging geographical gaps and facilitating the spontaneous relocation of economic activities, people, and capital to rural areas due to cost advantages.*

### INTRODUCTION

Integrated rural development refers to a comprehensive and holistic approach to rural development, where various sectors and activities are interconnected and coordinated to achieve sustainable development in rural areas. The idea of integrated rural development stemmed from the knowledge that successful development strategies are always based on a comprehensive approach to diverse and complementary areas and phenomena, while "selectively intervening on a narrow front rarely produces desired development impact" (Brinkerhoff, 1981).

Although very broadly formulated, all previous programs and projects of integrated rural development were until recently limited to improving the lives of rural communities in terms of improving infrastructure, sanitary conditions, environmental requirements, access to schooling and health services, poverty reduction through social programs and the like. A more specific approach to this development concept was only recently (2015) formulated by the Communist Party of China and refers to building entire value chains (based on agricultural inputs) in the area of primary production, that is, in rural areas. The new concept is not theoretically established, it does not even have a specific name. In China it was called literally "the integrated development of rural first, second, and third industries". The central goal of Chinese planners is clear and refers to the development of rural areas based on the synergistic development of all economic activities and the availability of occupations for all structures of the working-age population, instead of only low-skilled farmers.

Despite the obvious advantages, this approach to rural development has not been recorded not only in practice, but it has not been formulated as a separate theoretical concept, that is, there are no scientific works, which include intention to locate the entire value chain in rural areas. The absence of more ambitious goals for the establishment of the secondary and tertiary sectors in rural locations is not a particularly big failure of the planners if one takes into account that even much more modest goals (infrastructure, health service, etc.) were not realized. Namely, all programs of integrated rural development have been assessed as largely unsuccessful by governments, other competent authorities, participants and analysts.

Until the latest achievements in the field of digital technologies, it was not even possible to realize the complex goals of starting economic activities of higher sectors in rural communities, without fulfilling the mentioned elementary conditions. However, the more recent penetration of digitalization into all segments of society allows to jump over some "development steps", to overcome a large number of obstacles to

implementation, and what is the main topic of this research is digitalization as a new possibility to establish other "links" of the supply chain other than agricultural production.

The main goal of the research is to identify and classify problems and obstacles for the implementation of previous programs of integrated rural development, to identify those that can be overcome by digitalization and to identify the possibilities of digitalization in the construction of entire value chains in rural areas.

The research methodology includes:

- content analysis of primary data sources, mainly documents on the results of several dozen projects of integrated rural development, implemented on different continents in developing countries;
- analysis of the content of secondary data sources, scientific works on the results of such projects in developed countries;
- comparison and classification of challenges and obstacles to the implementation of integrated rural development;
- explanation of the development advantages that can potentially be enabled by the formation of the entire value chain in rural areas;
- explanation of the possibilities offered by digitalization for overcoming the identified obstacles of the implementation of integrated rural development in all its forms.

The first part of the article describes and explains the concept and current implementation of integrated rural development, including the new Chinese approach. Its potential development possibilities are described, the challenges and obstacles in implementation are identified and classified. The second part explores and explains the ways in which digitalization offers opportunities to overcome these obstacles.

## **1. THE INTEGRATED RURAL DEVELOPMENT**

### ***1.1. The concept and advantages of integrated rural development***

The concept of integrated rural development in the early 1970s was one of the "most important development intervention strategies used by the Third World governments" (Cohen, 1987). However, it very quickly took an important place in European agricultural policies. Later, the concept gained much broader meaning in the literature, adding non-productive sectors to optimize production. This expanded understanding of this model initiated the development of a whole new, holistic approach, which implies that "any

successful development must take into account the social, cultural, economic, environmental, and geographical realities that shape the lives of people all over the world" (UN, 2004).

Previous rural development programs, both in developed and developing countries, included different combinations of simultaneous development of several sectors. In developing countries, these development initiatives are often prominent due to the pressing need to alleviate poverty, address food security, improve access to basic services, and reduce inequalities in rural areas. In developed countries, these kinds of rural development initiatives tend to emphasize enhancing the competitiveness of rural economies, improving infrastructure, supporting entrepreneurship, and promoting sustainability (Wilson, 2004; Hodge and Midmore, 2008; OECD 2013).

The new, deepened concept of integrated rural development was proposed in Chinese document Guobanfa no. 93 (2015) and was called literally "the integrated development of rural first, second, and third industries". It implies to connect all agricultural production segments more functionally and station as many "links" as possible at the primary production location, i.e., rural areas. The rural development is based on expanding production activities in villages by adding activities from the secondary sector (processing, including development departments - R&D) and the tertiary sector (packaging, storage and warehousing, sales centres, bank branches focused on agricultural financing, even marketing agencies). Some segments of the tertiary sector, such as hobby agriculture and rural tourism based on location specificities, were previously included in the concept of integrated rural development, but not in development of this kind. Mostly, rural tourism projects were implemented as a separate project. These segments of tertiary sector now gaining additional importance due to the multiplication of content and products in rural areas.

The new approach of locating the entire value chain in rural areas offers additional possibilities in these same segments of rural well-being. Below is the author's attempt to identify, explain and classify the advantages of this approach. The advantages are grouped according to the most frequently stated goals of integrated rural development.

- Rural development: Developing the agricultural value chain in rural areas can stimulate economic growth by creating employment opportunities and generating income for rural communities.

- Food security: Strengthening the agricultural value chain ensures a steady supply of food and reduces dependency on external sources, enhancing food security for both rural and urban populations.
- Value Addition: Establishing the entire value chain allows for value addition at each stage, such as processing, packaging, and marketing, resulting in higher profitability for farmers and other stakeholders.
- Empowering Rural Communities: Developing the value chain can empower rural communities by providing them with control over their resources, improving their socio-economic status, and reducing migration to urban areas.

### *1.2. Challenges and obstacles to the implementation*

For the purposes of identifying obstacles to the implementation of this model, we analysed several dozen examples in practice, some of which were analysed based on primary sources (reports), others based on the works of authors who analysed these projects around the world. India has implemented various multi-sectoral rural development programs, such as the Integrated Rural Development Programme (IRDP), launched in 1978, National Rural Livelihoods Mission (NRLM) 2011 (Government of India, 2017), the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) (Ministry of rural development of India, 2005) etc. These initiatives focus on enhancing livelihood opportunities, promoting social inclusion, improving rural infrastructure, and providing social protection to rural communities (Joshi and Rao, 2017; Sarafraz and Manzoor, 2021; Kumar, 2021; Susman, 2021). The Brazilian Program for Sustainable Development of Rural Territories (launched 2003) focused on supporting integrated and sustainable development in specific rural territories. The Chinese Rural Revitalization Strategy (2018), which preceded the concept of integration of three sectors, have broadly set targets of the current multi-sectoral approach. Besides agriculture, health, infrastructure, poverty alleviation, and social welfare, it was included rural entrepreneurship, innovation education, rural tourism and cultural preservation (Guofa No. 12. 2019; Central Document No 1. 2021; Wu and Wen, 2022). The Comprehensive Rural Development Program (CRDP) in South Africa (launched 2009) aims to achieve "social cohesion and development of rural areas by ensuring improved access to basic services, enterprise development and village industrialisation" (Department of PME of South Africa). The Rural Development Board (BRDB), the Comilla Model in Bangladesh (Khan, 1983), and Ethiopia (Cohen, 1987) were also based on integrated

rural development. The Rural Integrated Development for the Eastern Region (PRIDE) Project (Tanzania) implemented in the 1980s. In addition to these nationally designed programs and strategies, the Millennium Villages Project (MVP), launched in several African countries by UNDP in the period 2005-2015 (MPA), was relevant at one time. This is only a small part of the analysed projects in this research.

All of these models were unable to fully achieve its goal in practice! Most of the literature on integrated rural development refers to analyses of "frequent failures of rural development policies in Europe" (Nemes, 2005). Most of the projects produced moderately significant to significant development results, but the effects lasted only until the end of the project. For example, the MFA was analysed in two large-scale studies that were carried out immediately after the end of the project (Mitchell et al., 2018; Sachs, 2018) and both showed that a third of the set goals were achieved, while the investments within the project were so much would bring greater benefit to the countries in the project without any project. Jeffrey Sachs (2018) shows that "the benefits to an MVP site of receiving \$60 per person per year were smaller for the MVP community than if the entire nation had received the same \$60 per person per year". According to Evaluation Steering Committee of mentioned strategy in South Africa, more than a half objective did not achieved, including infrastructure, poverty, sustainable development etc. (Evaluation Steering Committee, 2013). Only China recently established several dozen successful value chains in a few years. In the first year of implementation "all regions have improved the agricultural industrial chain by accelerating the development of agricultural product processing and circulation industries" (National Commission for Development and Reform, 2016). According to the MARA report from 2018 the integration of rural industries led to a 67% increase in farmers' income. By 2018 "more than half of the processing enterprises have built the whole industrial chain value chain by extending forward and backward" (MARA, 2018).

Extensive research and analysis of integrated rural development projects in developed and developing nations have highlighted the primary challenges and barriers hindering their widespread implementation. The most significant challenges for achieving a successful and sustainable application of this model are extracted from the above literature and documents as the most frequently highlighted obstacles. These are:

1. *The project approach* to rural development itself, which limits time and resources to a period of only a few years, which is the duration of



the project. The construction of the entire value chain at the location of production enables the rural community to generate significant income and continuously invest in its own development, guided by the needs of a large number of economic entities from various sectors of the economy;

2. *The problem of coordination*, given that the model includes a large number of very different entities;
3. *Inconsistency between top-down planning and bottom-up participation*;
4. *Weak access to finance* after the completion of the project;
5. *Technology and knowledge gap*;
6. *Market linkages*.

The effective management system in China, coupled with widespread digitalization efforts, has enabled the country to surmount various challenges. In contrast, many other nations are either unable or unwilling to alter their socio-political systems. However, the current state of ICT development has reached a level where it can substantially address prevalent constraints and hurdles in the context of integrated rural development. These identified problems and obstacles, in next section will act as a foundation for evaluating how digitalization can potentially contribute to the efficient functioning of the entire value chain.

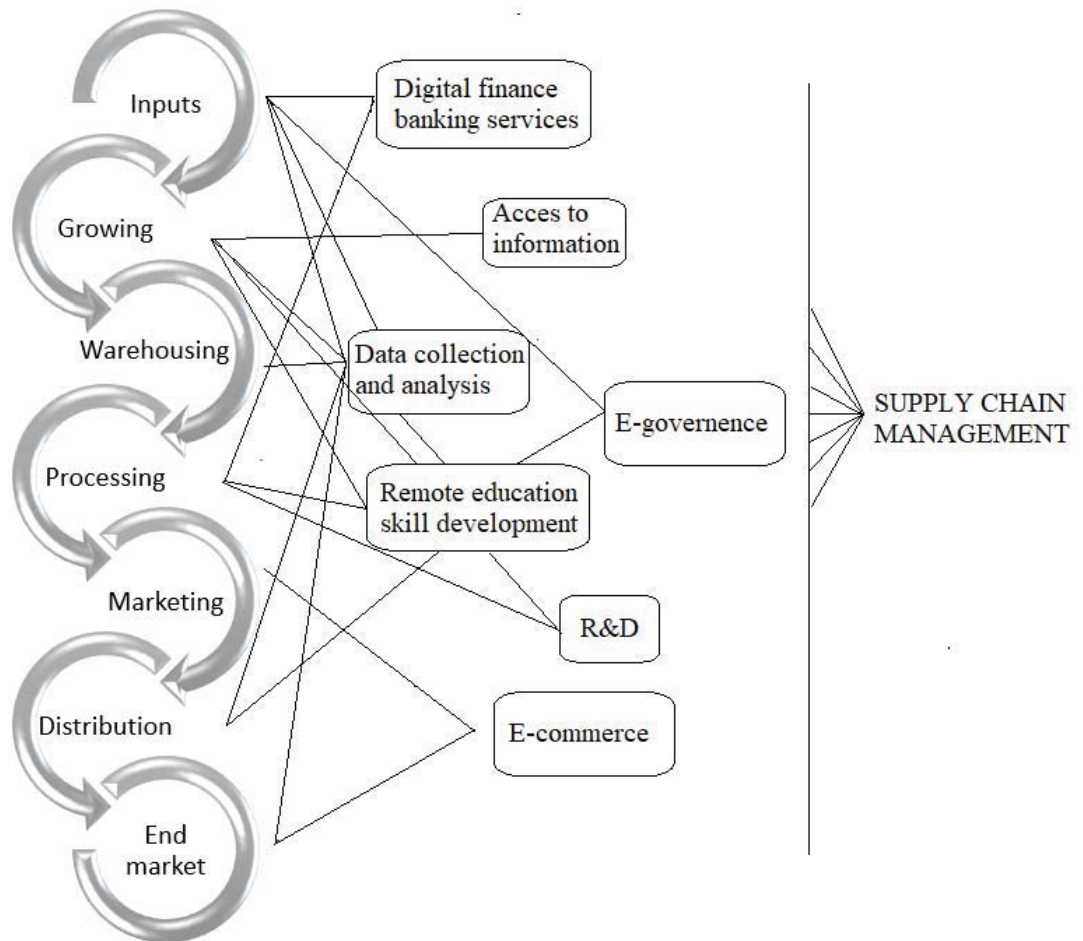
## **2. HARNESSING DIGITALIZATION IN ESTABLISHING RURAL VALUE CHAINS**

Except for the first of the listed problems, the project approach, which can be overcome by establishing additional links of the value chain, other cited challenges arise when implementing any concept of integrated rural development. Recently, with the accelerated development of information technologies, digitalization is emerging as the most efficient way to remove obstacles to integrated rural development and establish longer value chains in rural areas.

The graph illustrates an agriculture value chain, which has been successfully implemented only in several Chinese areas so far. With further advancements and increased use of digital technologies, it is anticipated that this approach will also be adopted in other countries with previous attempts to implement integrated rural development initiatives. The graph demonstrates the different forms of digital support available for enhancing

each stage of the supply chain and strengthening the connections between them.

**Figure 1.** The role of digitalization in managing the agricultural value chain



Source: Authors

### ***2.1. Access to information relevant to agricultural production***

Digital technologies offer farmers valuable information on agricultural practices, weather forecasts, market prices, and pest management. Some platforms provide location-specific data, while others offer broader knowledge applicable to various areas. Specific platforms focus on microlocation data from sensors, aiding farmers with precise insights for better decision-making, leading to increased productivity and efficiency.

Although universal expert information and locational weather forecasts are readily available, sensor-based platforms are still in the experimental phase, mainly limited to test fields in specific projects.

### ***2.2. Data collection and analysis of efficiency of value chain***

Digital data collection and analysis revolutionizes supply chain monitoring, allowing seamless tracking from producers to end users. Quantitative and qualitative data from rural stakeholders inform decision-making processes. Digitalization empowers real-time tracking using technologies like barcodes, RFID, and IoT, optimizing logistics, reducing waste, and ensuring timely deliveries.

With digital tools, inventory management becomes efficient through automated data capture and analysis. Farmers, suppliers, and distributors can track stock levels, expiry dates, and plan replenishment based on demand forecasts, minimizing stockouts and costs.

Furthermore, digitalization captures consumer preferences, market trends, and historical sales patterns, enabling accurate demand forecasting. Farmers align cultivation, suppliers optimize production and procurement, creating a data-driven approach that enhances supply chain efficiency.

### ***2.3. Digital financial services***

One of the problems faced by all multi-sectoral rural development programs in developing countries is the difficult access to financing (Cohen, 1987; MRDI, 1992, 1995; Mitchell et al., 2018; Sachs, 2018; Susman, 2021; Schneider et al. 2021). In the context of rural areas, digital finance and banking services can have a transformative impact by addressing the challenges of limited physical infrastructure and lack of access to traditional banking services. Of particular importance is access to financial resources, that is, loans in the first production stages of both agricultural production and the processing of these products. It is not only about initial capital, but seasonal lending is generally required in this business.

Agricultural finance platforms provide farmers with access to credit for purchasing inputs, equipment, and technology. Digital platforms also facilitate agricultural insurance, allowing farmers to protect their crops, livestock, and assets against natural disasters and market risks.

One of the newer types of digital platforms is online lending platforms and peer-to-peer lending networks, which connect rural borrowers with lenders, including individuals, institutions, and investors. This increases access to

credit for small-scale farmers, micro-entrepreneurs, and rural businesses, allowing them to invest in productive activities, expand their operations, and improve their livelihoods.

#### ***2.4. Market access and e-commerce***

Digitalization offers multiple ways to support market linkages in the agricultural value chain. Digital platforms and e-commerce solutions can bridge the gap between rural farmers and urban or export markets. Digital platforms provide opportunities for rural entrepreneurs and farmers to access broader markets beyond their local communities. E-commerce platforms and online marketplaces can connect rural producers directly with buyers (including services like a rural tourism), eliminating intermediaries and ensuring fair prices. This improves market access and increases income opportunities for rural communities. Mobile Applications provide market information, helping farmers make informed decisions about crop selection and timing of sales. Aggregators and e-commerce platforms enable farmers to reach a broader customer base and facilitate online sales and delivery services. Digitalization also enables traceability systems for product quality assurance and market intelligence tools for real-time insights on pricing and trends.

This segment of digitalization is already widely represented. In all analysed countries there are initiatives and programs of e-commerce. For instance, in India, there are several e-commerce platforms dedicated to agriculture, such as AgroStar, BigHaat, e-NAM (National Agricultural Market), and DeHaat. Rural e-commerce in China exceeds \$50 billion annually (FAO, 2019). In Africa, platforms like Twiga Foods in Kenya and Sokopepe in Tanzania have been established to connect farmers with markets. In Europe, platforms like Agrando in Germany and Agrikol in France provide similar services. Project Agricultural Market Information System in Bangladesh (AMIS) is one of the more successful national programs, although it is not oriented only to e-commerce. It included market data collection, information dissemination, price monitoring, market analysis, policy support, capacity building (Islam and Grönlund, 2007). These platforms can play an important role in the development of value chains in rural areas in the future.

#### ***2.5. Remote education and skill development***

Digitalization enables remote learning and skill development initiatives, which can enhance integrated rural development through educational opportunities and capacity building. Remote education allows access to quality learning without relocation. Online platforms enable virtual classrooms, educational resources, and instruction from qualified teachers. Skill development courses cover various subjects, enhancing employability and contributing to the local economy. Traditionally, rural-to-urban migration has been driven by the pursuit of education and limited prospects for applying that knowledge in rural settings. However, the concept of building the value chain in rural communities opens up a plethora of non-agricultural activities, from biotechnological laboratories to tourism management, harnessing the acquired knowledge and education effectively.

Currently, these digitalization benefits are underutilized in rural areas, with few formal education opportunities available. The one of the most massive example is Digital India, particularly program for agriculture named Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA). The program was initiated by the Government of India, which is one of the prerequisites for durability and consistency. Launched in 2015, by mid-2023, the program has recorded over 70 million registered applicants, and over 45 million certified students, which is a significant number regardless of the size of India's total population (PMGDISHA, 2023). However, it is only about digital literacy. Participants therefore physically go to the centres (of which there are over 430,000) in order to learn how to follow online content. This is therefore not a form of concrete education, but only a prerequisite for its future acquisition through digital platforms.

## ***2.6. E-governance and service delivery***

E-governance offers an opportunity to overcome the lack of mechanisms for administrative coordination of rural and urban communities and inconsistency between top-down planning and bottom-up participation, which is cited as one of the main obstacles to the implementation of any type of integrated rural development.

Digitalization enables efficient and accurate data collection, which is crucial for evidence-based decision-making. By using digital tools, rural development programs can gather data on various aspects, such as agricultural productivity, healthcare needs, education levels, infrastructure gaps, and socioeconomic conditions. This data can then be analysed to identify trends, prioritize interventions, and measure the impact of development efforts.

Digitalization can simplify management processes and service delivery in rural areas. Online portals and platforms can be established to facilitate the application and payment of government services and subsidies. This includes areas such as agricultural subsidies, government crop purchases, health care schemes, social welfare programs and educational grants.

The most successful example is Common Services Centres (CSCs) in India which act as access points for citizens to avail various government services digitally, including healthcare, education, banking, and utility bill payments (Common Service Centres, India). Another example of relatively broad government e-services is Malaysia's Smart Villages initiative which focuses on leveraging digital technology to enhance rural living conditions and economic opportunities (Laidin, 2016).

## CONCLUSION

For several decades, attempts have been made in a number of countries to create and implement strategies for the overall development of rural communities instead of development programs aimed only at improving agricultural production. Projects and programs of integrated rural development were numerous, but mostly included only socio-economic aspects of life in rural communities (infrastructure, education and health). The programs were unsuccessful or partially successful for several reasons that we identified by looking at the primary and secondary sources of several dozens of integrated rural development projects around the world.

The failure mainly stems from the project financing itself, which is limited to a few years, while improvements in the mentioned (non-profit) sectors require continuous investment. Integrated rural development recently received a conceptual solution embodied in the Chinese approach, which includes the construction of entire supply chains in rural areas. Increasing the volume of economic activities, especially those more profitable than agricultural production itself, provides the basis for the independence of rural development from project financing. The implementation of this concept proved to be significantly more successful than previous initiatives.

Other observed obstacles to the implementation of integrated rural development in previous attempts are: the problem of coordination of a large number of very different entities, inconsistency between top-down planning and bottom-up participation, weak access to finance in rural areas, technology and knowledge gap between rural and urban areas, and weak

connection with the market. These problems cannot be eliminated by adding secondary and tertiary sector economic activities.

The rapid advancement of Information and Communication Technology (ICT) has only recently presented opportunities to overcome these challenges. In the modern field-to-market supply chain, each component can benefit from digital enhancements, often through various forms of digital support.

1. The initial link, encompassing inputs, benefits from digital finance for the commencement of the agricultural cycle. E-governance plays a pivotal role in managing subsidies and input supply, while Research and Development (R&D) fosters the development of superior seed varieties and chemical preparations. Digital data collection and analysis facilitate efficient connectivity with other links in the chain.
2. Throughout the agricultural production process, digital platforms provide access to pertinent information such as weather conditions, essential agronomic practices, and product pricing, addressing the comprehensive informational needs of farmers. This aspect of the chain can also benefit significantly from remote education and skill development initiatives and remains intertwined with other components through digital data collection and analysis.
3. The third link in the chain pertains to the storage and distribution of essential agricultural products. Here, digital data and analysis assume critical roles in optimizing efficiency, particularly given the perishable nature of these products.
4. The processing of agricultural products can now be effectively established at the primary production location, thanks to the availability of advanced digital banking services and substantial opportunities in remote education and skill development, empowering rural populations to engage in industrial production. Additionally, R&D continually enhances the quality, safety, and environmental sustainability of agricultural products.
5. Marketing, as a crucial facet of the agricultural value chain, enables farmers and rural residents to better promote both processed and unprocessed agricultural products, as well as services like rural tourism, through e-commerce platforms.
6. The distribution of goods at various stages of processing to specific users is significantly streamlined by the evolution of e-government in terms of procurement of essential products, along with digital data

collection and analysis pertaining to quantities produced, types, and stages of goods processing.

7. Lastly, e-commerce and digital data collection and analysis play pivotal roles in facilitating the placement of food products at all processing stages, as well as rural community services, aligning them with the distinct needs and preferences of end users across diverse geographical locations.

The intrinsic isolation of rural communities and primary agricultural production from the broader economy can now be effectively addressed thanks to the extensive adoption of advanced digital technologies. While ICT does not guarantee rural development, its current level of development is more than sufficient to surmount the primary obstacles encountered in rural community development.

Government intervention is no longer imperative to initiate secondary and tertiary sector endeavours in rural locales, along with their associated developmental aspects. Digitalization has already transcended the geographical isolation of villages in a functional sense. Consequently, the shift of other economic activities, individuals, and capital toward rural areas can occur organically, capitalizing on the conventional advantages of reduced costs.

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## DIGITALIZATION IN AGRICULTURE AND APPLICATION IN SERBIA<sup>1</sup>

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**Abstract:** *The subject of the paper is analysis of the possibility of application of new digital technologies in all production and processing stages and sectors. The goal of paper is to show that digitalization in agriculture entails the changes that may be positive and negative. Positive changes are reflected in the shortening of the time required for submission of request for subsidies and their payment. Negative changes refer to the age and level of education of the holder of agricultural holdings who should implement digitalization on their holding. Also, in paper has given comparative review of resulting legal changes in agriculture and rural development based on the two analysed Laws on Incentives in Agriculture and Rural Development in 2016 and 2023. The research used the following methods: induction, deduction, analysis, synthesis, description and desk research. The results of the research show that the application of new digital technologies has more advantages than disadvantages, which is why it is increasingly represented in all forms of society's functioning.*

**Keywords:** *digitalization, agriculture, subsidies, software solution.*

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## INTRODUCTION

Digitization largely participates and sometimes replaces human activities in numerous processes and activities. Therefore, its application records positive results, both from the point of view of the economy and from the point of view of protecting biodiversity and the environment (Rolandi et al., 2021; Vasile, 2012; Vial, 2021).

Digitalization in agriculture can be considered as the result of the fourth industrial revolution. The application of the latest digital achievements in agricultural and food production can also be explained as a consequence of climate change. Therefore, at the global level, the entire society (economy and public administration) is implementing technological transformations. In this way, digitalization throughout the world will contribute to greater transparency of public data (Androniceanu et al., 2022). Information and communication technologies in agricultural production play an important role in the modern world because they significantly affect all aspects of life (social, economic, and political). Ultimately, it affects the state as a community (Sinitza et al., 2021).

Digital agriculture can also be called precision agriculture, taking into account its following aspects (Goldman Sachs Group, 2016):

- a) *Precision planting* – it is important from the aspect of reducing the loss of seeds used for sowing/planting, and for increasing the yield;
- b) *Precision fertilizer application* – it is significant because it influences yield maximization while minimizing fertilization costs;
- c) *Drones* – it is faster to collect data from the field and get results using drones than the human factor could go around on foot;
- d) *Data integration* – it is necessary to create a software solution that would monitor meteorological indicators, provide information on the condition of crops during the growing season, and forecast the profitability of production.

All of the above are not the only activities related to precision agriculture, so we would also mention precision irrigation, field monitoring, and precision spraying. Data collected by sensors, satellites, and drones on the state of the soil, plants, and weather conditions can also provide economic benefits, as they affect the increase in production, product quality, and farmers' incomes (Rolandi et al., 2021; Jha et al., 2019; Vinuesa et al., 2020).

Group of authors Radović et al. (2021) states that precision agriculture is a form of application of high technology to support agricultural production in the form of monitoring soil conditions, increasing yields, and creating lower economic costs.

Agricultural activity is very important for the Serbian economy for two reasons. First, it has various natural potentials and climatic conditions. The second one constantly achieves a surplus in foreign trade, that is, it records a positive balance in the exchange of agricultural and food products with other countries of the world. (Popović, Grujić, 2015; Grujić et al., 2021). Therefore, we should invest in the digitization of agriculture in Serbia, because the application of digital technologies is at a low level. Authors Radović et al. (2021) believe that the biggest problem with the greater representation of digitization in Serbia is the unfavorable educational structure of the population and that it is necessary to implement digital literacy of the rural population while harmonizing with labor market tendencies (Vukadinović et al., 2022). Authors Jurjević et al. (2019) believe that only large agricultural farms oriented toward the market have investments in new technologies to compete with foreign agricultural producers.

## **1. METHODOLOGY**

The methodological framework of this research is the desk research method and includes deduction and induction in drawing conclusions. Also, the method of content analysis of scientific works, published texts, and documents and systematization of collected information according to research objectives was used. The main goal of this paper is to present the changes that occurred in agricultural activity before and after the introduction of digitization in Serbia, including their advantages and disadvantages.

The initial hypothesis is that digitization in agriculture accelerates the payment of incentives and the production of food. The originality of the work was achieved through analysis aimed at the set goal of the research and critical evaluation of knowledge. The added value, first of all, is reflected in the attractiveness of the topic and the importance of the defined objective of the analysis.

## 2. RESULTS AND DISCUSSION

Agricultural producers in Serbia spent a lot of time collecting data and documents for the purpose of trading on markets, registering seasonal workers, applying for certain incentives, measures, etc. In the following, we will talk about some digital solutions in agriculture that Serbia has already implemented with plans for the coming years.

During 2019. an electronic platform for registering seasonal workers in agriculture was introduced (NALED, Registration of agricultural holdings in a few clicks). Given that it took a long time to register a seasonal worker, this platform accelerated the process and contributed to an increase in the number of registered seasonal workers by about 95% (Ministry of finance, Tax administration, Portal of seasonal workers). Activities on the development of this platform began in 2015, and already in 2019. She started working. This decision is also in accordance with the Law on Simplified Employment of Seasonal Jobs in Certain Activities (**Official Gazette of RS, No. 50/2018**).

At the beginning of April 2020, when the COVID-19 pandemic began and a state of emergency was introduced in Serbia, the Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia launched the electronic green market platform *ePijaca* (Serbian language). The Ministry decided to take this step because it saw that the COVID-19 pandemic has affected many agricultural producers due to the inability to take their products and sell them on the market (Ministry of Agriculture, Forestry and Water Management, Ministry Announcements). This "interactive" market offers a wide variety of products (fruits, vegetables, flour, pasta, milk and dairy products, meat and meat products, eggs, honey, alcoholic beverages, etc.), and agricultural producers deliver their products directly or by courier services. The eMarket platform was also written about in the Netherlands. Namely, on the website Ministry of Agriculture, Nature and Food Quality in Holland the news was published that the *ePijaca* platform was launched in Serbia, which should connect farmers and buyers during the state of emergency, but they did not consider the sustainability of this platform after the end of the state of emergency (Ministry of Agriculture, Nature and Food Quality in Holland). By accessing the electronic database *ePijaca* (Ministry of Agriculture, Forestry and Water Management, *ePijaca*) we saw that there are 1,388 registered agricultural producers from all over Serbia who sell the most diverse agricultural products (status on day 24.08.2023).

Back in 2019, the idea of the National Alliance for Local Economic Development (NALED) was to introduce an electronic register of agricultural farms, payment of incentives, and renewal of farm registration. This idea was born on the basis of the fact that farmers spend a lot of time collecting and submitting documentation for applying certain incentives and measures. Also, officials waste a lot of time checking the submitted data. Therefore, the eAgrar software solution was designed, which would control the correctness of the entered data by viewing the electronic database of the real estate cadastre, the Ministry of Internal Affairs, the Agency for Business Registers, the Veterinary Administration, and other relevant institutions. Therefore, the holders of agricultural holdings would themselves enter data about the holding, the members of the holding, the plots on which they produce, the animals or the crops they grow (NALED, e-Agriculture).

In the meantime (since 2019), such a program has been developed, and from March 2023. the electronic register of agricultural holdings (eRPG), which is part of *eAgrara* (Ministry of Agriculture, Forestry and Water Management, eAgrar). It is important to mention that as a result of the COVID-19 pandemic, the planned activities for the implementation of the program "Improving the management of the register of agricultural holdings and approving national incentives in agriculture through the development of the portal - *eAgrar*" have slowed down. After the end of this crisis, Serbia managed to launch the *eAgrar* software on time, given that the agriculture and food industry sectors were not significantly affected by the crisis (Kisin et al., 2021).

At the end of 2022. the introduction of the electronic field book for tenants of agricultural land was announced in the next two to three years (the assumption is by 2024/2025). (<https://naled.rs/vest-prijava-poljoprivrednih-gazdinstava-u-par-klikova-od-2023-7388>). This announcement is aligned with the provisions of the Law on Amendments to the Law on Agricultural Land from 2017 (Official Gazette of RS, No. 80/2017). According to this Law, the tenant of state-owned agricultural land is obliged to establish a crop rotation and keep a field book for plant production.

After the introduction of the eAgrar software, Serbia was obliged to pass an amended law on incentives in agriculture that would include the application of the mentioned software solution. Accordingly, Table 1 provides a brief overview of the changes in the Law on Incentives in Agriculture and Rural Development that were adopted in 2016 and 2023.

**Table 1.** Changes in the Law on Incentives in Agriculture and Rural Development of Serbia between the two adoption periods, 2016 and 2023

<b>Characteristics</b>	<b>Law on Incentives in Agriculture and Rural Development, 2016</b>	<b>Law on Incentives in Agriculture and Rural Development, 2023</b>
Initiation of the procedure for exercising the right to incentives	In person at the Administration for Agrarian Payments	Electronically, through the eAgrar software solution.
Payment of incentives	To the designated account of the beneficiary of the incentive	To the designated account of the beneficiary of the incentive
Register of incentives in agriculture and rural development	It is conducted in electronic form	It is conducted in electronic form

*Source:* Law on Incentives in Agriculture and Rural Development, which was in force until April 29, 2023. year (Official Gazette of RS, No. 101/2016); Law on Incentives in Agriculture and Rural Development adopted on April 29, 2023. year (Official Gazette of RS, No. 35/2023).

Until the establishment of the eAgrar software solution, all applications for exercising the right to incentives were submitted in paper form. With the adoption of the amended Law on Incentives in Agriculture and Rural Development (2023), the submission of applications for incentives in paper form is abolished, and from the current Law on Incentives in Agriculture and Rural Development, we have singled out important facts that were introduced and refer to the functioning of the eAgrar software:

- Obligations for the incentive of the line ministry must not be greater than the approved value for a specific appropriation in that budget year;
- The eAgrar software solution is established and managed by the Administration for Agrarian Payments;
- The technical correctness and functioning of the eAgrar system is ensured by the state administration body responsible for these tasks;
- The software solution has a high level of reliability and trust in the time of electronic business and communications;



- In certain procedures for exercising the right to incentives through the eAgrar program, the competent authorities have the authority to assign marks of an internal nature to certain requests;
- If requests for exercising the right to incentives are not submitted through the eAgrar program, the director of the Administration for Agrarian Payments rejects them by decision;
- In order to exercise the right to incentives, all additional documentation is exchanged electronically.

Based on these facts, we conclude that the eAgrar program can significantly contribute to speeding up the procedure of receiving, reviewing, supplementing documentation (if necessary) and making a decision on accepting/rejecting the payment of incentives based on the Request.

In the continuation of the work, the Systematization of changes in the Laws on Incentives in Agriculture and Rural Development adopted in 2016 and 2023 is given. (Table 2).

**Table 2.** Systematization of amendments to the Law on Incentives in Agriculture and Rural Development of Serbia, 2016 and 2023.

Characteristics	Law on Incentives in Agriculture and Rural Development, 2016	Law on Incentives in Agriculture and Rural Development, 2023
Agricultural policy at the AP and LGU level (direct payments, namely rebates for storage costs in public warehouses, rebates for artificial insemination, as well as rural development)	✓	✓
<i>Direct Payments/Milk Premium (quantity per quarter; milk premium amount)</i>	At least 3,000 l of cow's milk per quarter, or at least 1,500 l of cow's milk per quarter produced in an area with difficult working conditions in agriculture; the premium amount for milk is 0.06 EUR/l* of milk	There is no defined limit for the amount of milk delivered as a condition for payment of incentives; the premium amount for milk is 0.09 EUR/l*

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		of milk
In livestock production, in addition to other incentives, there were incentives for lactating cows in the minimum amount of EUR 170.54* per head	✓	
In livestock production, in addition to other incentives, an incentive for female calves from quality first-calf breeding cows is included in the amount of EUR 213.18* per head		✓
Basic incentives for plant production of 51.16 EUR/ha*, and only the area of land in own ownership up to 20 ha is taken into account	✓	✓
For the basic incentives in crop production (per ha), the land that was leased based on a public tender is counted		✓
In organic plant production, incentives are increased by a minimum of 40% in relation to the amounts of incentives for plant production and rebates for fuel and/or fertilizer and/or seeds.	✓	✓
In organic livestock production, incentives are increased by a minimum of 40% compared to the amounts of incentives in livestock	✓	✓

\*The original currency is RSD, but for the purposes of writing the paper, their values were converted into EUR according to the middle exchange rate of the National Bank of Serbia (NBS) as of April 28, 2023, because the new Law began to apply on April 30, 2023 (1 EUR = 117.2719 RSD).

**Source:** Law on Incentives in Agriculture and Rural Development, 2016; Law on Incentives in Agriculture and Rural Development, 2023.

Given that the current Law on Incentives in Agriculture and Rural Development shows the classification of incentives, acceptable measures, obligations of the beneficiaries of incentives and their payment, we can conclude that the initial hypothesis has been confirmed, ie. to accelerate the process of production of agricultural products and food due to the accelerated procedure for submitting requests for incentives and their payment.

### **3. ADVANTAGES AND DISADVANTAGES OF DIGITALIZATION IN AGRICULTURE**

According to the previous points, it was observed that the mentioned software solutions have more benefits than disadvantages, and we single out the most important ones:

- speed up procedures and application procedures on different grounds;
- no waiting in lines to submit various requests;
- timely adoption of decisions on the payment of subsidies based on submitted requests;
- There are no trips to other institutions in order to obtain certificates and collect documentation, but the data of the relevant institutions are combined;
- The introduction of such software solutions into the most diverse streams of society is desirable from the aspect of harmonizing national legislation with European standards,
- reduction of administrative costs.

When it comes to the shortcomings of the analyzed software solutions, as the biggest drawback in their implementation, we point out the age structure of the owners of agricultural farms and the level of their computer literacy, bearing in mind that they will use these applications. Radičić (2022) states that these problems can be solved by holding seminars, and trainings, opening call centers for assistance, visits to farmers, etc.

If we look at the advantages and disadvantages of digitization in agriculture, we highlight the views of Lioutas et al. (2021). They divided the advantages of digitization in agriculture into two groups, namely those originating from farms and those related to the environment of the farm. In this part of the paper, we highlight the following advantages of digitization in agriculture:

greater efficiency of agricultural holdings, increased production, reduced environmental pollution, globalization in food production, etc.

According to the previously mentioned authors, we highlight the disadvantages of digitization in agriculture, which they divided into three groups, namely: social (divisions between small and large farmers, as well as countries according to the level of development, workers with a low level of education hardly adopt changes); ecological (loss of traditional plant cultures); cultural (deviation from traditional agricultural production).

In general, we conclude that the implementation of digitization in agriculture, including aspects of precision agriculture, has more advantages than disadvantages, it is only a question of what goals we set in order to engage in agricultural production.

## CONCLUSION

This paper gave an overview of research on digitization in the broadest sense, which was an introduction to the story of digitization in agriculture in theory and practice.

Serbia has shown that digitization has a positive impact on all aspects of society, and therefore on the progress of the entire country. A country's progress in the digital world will determine its efficiency and well-being due to the impact it has on the economy.

In this paper, certain activities that have been carried out in the direction of digitization in agriculture have been pointed out, but it has also been hinted at which activities are planned for the next period (2-3 years).

We concluded that social sciences alone cannot contribute to a greater representation of digitization in agriculture, which is why they need to be in constant contact with natural and social sciences. That is why future research on digitalization in agriculture should focus on multidisciplinary investigations, in order to unite different scientific areas and obtain adequate results.

The introduction of digitization in agriculture has also shown us that it contributes to greater data transparency, given that the electronically linked data are all from the relevant institutions and that the data is collected *ex officio*.

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## INSURERS OF THE FUTURE

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**Abstract:** *Data and analytics are changing the basis of competition. Leading insurance companies use data and analytics not only to improve their core processes and operations, but also to drive entirely new business models. Traditionally, insurers have valuable historical data and statistics. However, will they be able to keep up and still provide added value when competing with innovative companies, who often have new data at their disposal in real time. Another question is how to organize the implementation of digitization in insurance.*



*In this paper, we will propose a digitalization model in an insurance company based on ChatGPT.*

**Keywords:** *digitization, insurance, ChatGPT, model.*

## INTRODUCTION

The development of technology in the insurance industry is complex and dynamic field that shapes the way insurance companies operate. This transformation is of essential importance, as it enables insurance companies to enhance efficiency, to increase customer satisfaction and to improve understanding of risks. This is particularly crucial in today's world, where customers expect quick and easy access to services. Digitalization is reflected in a wide range of technological innovations, such as cloud computing, Big Data analysis, artificial intelligence (AI), Internet of Things (IoT), Blockchain (BC) (Bjelobaba et al. 2022), Image processing (Ralevic and Paunovic, 2021) etc. The development of technology in insurance industry brings many challenges and opportunities that need to be carefully analyzed.

Advanced data analysis techniques help insurance companies to understand risks better and to develop more efficient risk assessment models. Digitalization allows insurance companies to manage their portfolios and risks more effectively, and consequently can lead to better business planning and greater profitability, as well as, lead to the development of innovative products and services, such as IoT-based insurance. This can open up new markets for insurance companies and attract new customer segments. Innovation is key to the long-term success of insurance companies in the digital age. New products and services can create competitive advantages. In the field of digitalization insurance there is a lot of room for further improvements, because insurance clients are happy to use online platforms only if they feel that those are safe (Doganjic, 2022). The development of technology enables insurance companies to personalize offers and policy prices based on individual risks and customer needs and offer personalized services and rates (Paunovic and Ralevic, 2021). Personalizing services can attract clients and enhance their insurance experience, thereby increasing loyalty. Additionally, faster and more precise processing of insurance requests improves customer satisfaction and reduces operational costs. Digital tools, such as chatbots and artificial intelligence, can expedite request processing and reduce fraud (Eman and Alanazi, 2023).

Insurance companies gather vast amount of sensitive client data, including health information, assets and financial transactions. This poses a risk of data leaks and privacy breaches, which can result in a loss of client trust and can lead to legal issues. Data collection and protection are becoming increasingly critical challenges in the digital age. Insurance companies must invest in security measures and comply with data protection regulations to safeguard the integrity of client information (Paunovic, 2019). Stringent regulations can hinder the adoption of new technologies and innovations in the insurance industry and also increase compliance costs. Regulators are responsible for preserving the stability and integrity of the insurance industry. However, overly restrictive regulations can stifle innovation and deprive companies of development opportunities .

These challenges and opportunities present a complex landscape in which insurance companies operate in the digital age. Analyzing these aspects helps in understanding how the industry is adapting and using new technologies to gain a competitive edge. With the emergence of innovative technology startups and new players in the insurance market, traditional companies face increasing competition and potential disruption to their traditional business models. Traditional companies must react quickly and adapt their business to remain competitive. However, digital transformation requires changes in how companies operate and approach the market. These challenges can be financial and organizational. Integrating new technologies requires significant investments in infrastructure and employee training, which can increase operational costs.

## **1. CHATGPT/GPT AND ITS APPLICATION IN INSURANCE**

GPT (Generative Pre-trained Transformer) is a language model developed by OpenAI and is a part of advanced artificial intelligence. It possesses a vast number of parameters, enabling the model to learn complex patterns and generate high-quality textual content. GPT is trained through self-supervised learning, meaning it didn't require precise answers or annotations during training. Although the model was trained without specific domains in mind, it has demonstrated the ability to tackle various types of language tasks, including text translation, content generation, answering questions, and many others. In study (Ray, 2023) author explores the potential challenges and ethical concerns surrounding the use of ChatGPT in research, while highlighting the importance of striking a balance between AI-assisted

innovation and human expertise. This work also includes some biases and limitations of ChatGPT.

This technology is used in the insurance sector in nearly all processes: providing various services to customers, claim processing, assistance in submitting insurance requests, in sales, lead generation, and information sharing. It can respond to various queries, including policy information, insurance coverage details, cost estimates, claims progress updates, and more. Insurers can enhance customer experiences, streamline procedures, improve operational efficiency, and offer specialized and efficient services to policyholders. ChatGPT promotes efficient communication and ensures the sharing of accurate and timely information by serving as a link between insurers and clients. Insurance company AXA has developed its own generative artificial intelligence platform that AXA staff can securely access to generate, summarize, translate, and correct texts, images, and codes. Called "AXA Secure GPT," the new internal platform was developed by AXA's in-house experts. It will allow employees of the insurer to leverage the transformative technologies of generative AI and large language models without the fear of security breaches and data leaks. Currently, the service is available to 1,000 colleagues within AXA group operations and the plan is to roll out AXA Secure GPT to all employees.

GPT can be integrated into insurance company chatbots to provide fast and accurate customer support. Chatbots can answer questions about policies, process claims, explain insurance terms in an understandable manner, and even assist clients in choosing the best insurance options. The model can generate informative articles and insurance guides to educate clients. For example, a client can ask the chatbot, "What is the difference between a deductible and a copayment?" GPT can analyze these questions and provide clear, understandable answers. This can contribute to better understanding of policy terms and proper use of insurance. Well-informed clients are often more satisfied and less prone to disputes or misunderstandings about insurance terms.

Furthermore, integrating GPT into chatbots allows companies to enhance the customer experience by providing real-time answers without the need to wait for support operators. Additionally, chatbots are available 24/7, improving accessibility for clients. Insurance companies can use GPT for personalized marketing by creating tailored offers for their clients. GPT can analyze client data, including insurance history, claims, and needs. Based on this data, the model can generate personalized insurance offers and communicate them to clients. Personalizing offers enables companies to present clients with the

best options for their needs, taking factors like insurance type, coverage, premium, and duration into account. When clients receive offers that match their needs, there is a higher likelihood that they will accept them. Moreover, if an insurance company has a client who already has auto insurance and travel insurance, GPT can suggest an additional home insurance policy, providing comprehensive protection. This increases the sale of new policies and boosts client loyalty.

GPT can automate the analysis of risk and damage data, predict potential scenarios and identify potential risks before they become serious issues. This can help companies better understand and manage risks, which can improve company profitability. For example, when a company collects customer data through IoT sensors in vehicles, GPT can analyze this data to identify potential risky patterns, such as frequent speeding violations and suggest strategies to mitigate these risks.

Automation of processes reduces the need for human intervention and speeds up the processing of claims. This can reduce operational costs, increase efficiency, enhance customer satisfaction and lower the company's operational expenses. For instance, when a client reports a traffic accident through the insurance company's application, GPT can automatically analyze the damage information and generate a preliminary cost estimate for repairs. This speeds up the claims process.

These specific examples demonstrate how GPT can enhance various aspects of the insurance industry, including marketing, customer support, request processing and risk management. The implementation of these solutions requires careful planning and integration but can bring significant benefits to companies and their clients.

However, it is important to mention that the current use of GPT in insurance also presents challenges, such as data security and the need for careful oversight. The interpretation and acceptance of generated information must be closely monitored to ensure accuracy and service quality.

## **2. HEALTH INSURANCE AND GPT**

The introduction of GPT into health insurance has significant potential to improve various aspects of this field, including data management, customer experience, and decision-making processes. This advanced language model can play a crucial role in transforming health insurance in several ways. GPT can analyze vast amounts of medical data, including medical records,

laboratory results, and radiological images. Based on this data, the model can assist in accurate diagnoses and predict potential health issues. Additionally, if a patient presents a range of symptoms, GPT can help by suggesting possible causes and necessary tests to confirm a diagnosis. Also, GPT can analyze clients' historical health data and their needs to generate personalized health plans for disease prevention or management of chronic conditions and recommendations. This can help insurance companies offer more tailored policies. It can be integrated into insurance company chatbots to provide faster and more accurate support to clients regarding health-related inquiries. GPT can analyze use personalized health plans to generate personalized health insurance plans. These plans may include different levels of coverage, premiums, and options. The insurance company can use GPT to analyze a client's health data and propose a plan with a focus on chronic disease prevention, with additions such as coverage for specific medical procedures or medications. Numerous studies are considering the use and effectiveness of GPT in various healthcare areas such as (Benet, 2023, Javaid et al.,2023, Darkhabani et al., 2023).

Additionally, the model can generate educational content about health plans and preventive measures.

### **3. A CONCEPTUAL MODEL BASED ON CHATGPR**

Adapting to the digital age, training employees to work with AI and GPT, and considering ethical and security issues play a crucial role in the successful implementation of artificial intelligence, including GPT, in the insurance industry. In the era of digital transformation, insurance companies need to develop strategies that allow them to adapt to the changes brought by artificial intelligence. In order to ensure success, it's essential to identify goals, assess needs and resources, to plan implementation, and provide training for key employees.

1. **Goal Identification:** Defining clear objectives to be achieved through the implementation of GPT and other AI technologies, such as improving customer experience, increasing operational efficiency, and reducing risks.
2. **Needs and Resource Analysis:** Evaluating existing resources, skills, and infrastructure to identify areas that require additional efforts or investments.

3. **Implementation Planning:** Developing a detailed plan for the implementation of AI solutions, including setting goals, timelines and resources. Continuously testing AI systems and iteratively improving performance to achieve the desired level of accuracy and efficiency.
4. **Employee Training:** Plays a crucial role in the successful integration of GPT into business processes. Artificial intelligence is evolving rapidly, so it's essential to provide ongoing training to keep employees up-to-date with the latest developments and applications of AI technology. Identifying employees who will work directly or indirectly with GPT solutions, including programmers, data analysts and customer support, is crucial in the implementation process. It is essential to develop customized training programs that cater to the specific needs of each employee group. For example, programmers will need to learn how to integrate GPT into existing applications, while customer support staff will need to understand how to use AI to better respond to customer queries.

The implementation of GPT and other AI solutions in insurance requires careful consideration of ethical and security issues. Ensure that customer data is used ethically and in accordance with data privacy laws. Transparency in the operation of AI systems, including clear communication to customers when they are interacting with AI entities instead of humans, is essential.

### ***3.1. Model***

The proposed conceptual model provides insurance companies with guidance on using GPT to provide better customer support in the field of health insurance. It is important to note that each company can customize such a model to meet its specific needs and comply with data protection and client privacy legislation. The Conceptual Model for Using GPT in Health Insurance, with its main modules, is outlined below.

**I Client/User.** This is the starting point for interaction with the system. The client can be an insured individual with questions about their policy, potential coverage or healthcare services. The client can also be an insurance agent or an employee of the insurance company.

**II GPT-Powered Chatbot.** The chatbot serves as the interface using GPT to communicate with clients. It employs natural language to interact with clients and understand their inquiries. It can generate responses to questions and provide information about policies, coverage and insurance terms. Clients can ask questions to chatbots about their health policies and receive clear and accurate real-time answers. Clients can also inquire about policies, coverage, and insurance terms. For example, clients can ask a variety of questions to the insurance company's chatbot, such as: "Does my policy cover (name of the medication)?"

"Please explain the standard coverage included in my insurance policy and whether my insurance policy covers physical therapy."

"Where in city of Kruševac can I get a comprehensive check-up covered by my insurance policy?" etc.

GPT can analyze policy terms, the network of healthcare facilities, and other information to provide quick answers, reducing the need to contact customer support. Insurance agents can also ask questions like:

"I am creating an offer for the insured person (name and surname) who is renewing their insurance policy. Based on their history of services used, which of our insurance packages best suits the client's needs?"

"I need a detailed overview of insurance coverage (name of insurance product). Can you provide me with this review, including exclusions and supplementary insurance?" etc.

**III Integration with the Database.** This is where information about policies, client's medical histories, and other relevant data is stored. The chatbot utilizes this data to personalize responses and provide accurate information. Insurance companies must be diligent in data management, ensuring data accuracy and currency while securely disposing of data when it is no longer needed to prevent leaks or misuse.

**IV Medical Expertise.** The chatbot can correctly identify when it's necessary to redirect clients to medical experts. When the chatbot recognizes more serious health-related queries, it can refer the client to medical

professionals. Medical experts can be available for video consultations or provide additional explanations.

**V Security and Data Protection.** This component is crucial for safeguarding client data's privacy and security. The system must have robust security measures in place to prevent unauthorized access and the leakage of sensitive information. AI models like GPT can exhibit inherent biases in their responses if not carefully trained, potentially leading to discrimination or inaccurate information. Insurance companies must ensure that all data used in interactions with GPT is adequately protected. This includes client data, medical information, and other sensitive data. All access to this data must be strictly controlled and encrypted. Implementing strong security measures to prevent unauthorized access to AI systems, including multi-factor authentication, access control, and user activity monitoring.

**VI Training and Monitoring.** This phase involves training the GPT model for specific health insurance needs. It also encompasses continuous monitoring of the system to ensure the accuracy and adequacy of responses. Understanding how GPT operates and makes decisions is crucial for maintaining safety and transparency. Insurance companies should be able to explain how specific decisions were made by GPT and why certain premiums were offered. AI models need to be regularly updated and monitored to maintain the accuracy and adequacy of responses. This includes tracking any irregularities or anomalies in model behavior.

**VII Ethical Framework.** Developing and implementing an ethical framework that sets guidelines for responsible AI use in insurance. The ethical aspects of applying GPT and other AI technologies in insurance are critical and require careful consideration and alignment with appropriate guidelines and data privacy regulations. How to prevent discrimination or bias in GPT decisions, especially in risk assessment or premiums? AI models may inadvertently make discriminatory decisions if trained on biased data, such as setting higher premiums for certain ethnic groups. How to ensure transparency in GPT's operation and enable users to understand how specific decisions were made? Insurance companies need to be able to explain how GPT assessed the risk for a particular client and why a specific premium was offered. How to ensure that personal client data is adequately protected



during interactions with GPT? Leaking or misusing clients' medical data can seriously jeopardize privacy and trust. Who is responsible for decisions made by GPT, and how are any errors or incorrect assessments corrected and compensated to clients? How to ensure that GPT recognizes situations that require intervention from actual experts, especially in the field of health insurance? GPT can be excellent for basic queries but is not capable of providing medical advice in emergency situations. How to ensure that users have control over their data and can make informed decisions? Users should be informed about how their data is used and have the right to consent or decline interaction with GPT. Insurance companies need to work on developing and implementing ethical guidelines and codes related to the use of GPT and other AI systems. They should also collaborate with regulators to ensure that AI implementation in insurance complies with the highest ethical standards and data privacy regulations.

## CONCLUSION

Insurance companies that successfully overcome challenges and harness the opportunities of the digital age can gain competitive advantages and provide better services to their clients. With proper planning and implementation of digital strategies, these companies can remain relevant in the dynamic insurance environment. However, it's crucial to maintain accuracy, quality of communication with clients, and to address data security and privacy concerns. Regular audits and security measure reviews ensure that all data protection measures align with standards and regulations. Employee training on data security rules and how to handle incidents is essential. Establishing strong security measures to protect data from potential attacks or leaks. Developing and implementing ethical guidelines defining responsible AI use in insurance and committing to upholding those standards are also paramount. Through careful planning, training, and ethical considerations, insurance companies can harness the benefits of the digital age without compromising client integrity and security.

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## THE USE OF BLOCKCHAIN AS A DIGITAL TOOL IN THE DEVELOPMENT OF ORGANIC AGRICULTURE IN REPUBLIC OF SERBIA

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**Abstract:** *The aim of this paper is to present the Blockchain technology as a digital tool that can be used in the development of organic production at the level of the Republic of Serbia. Although blockchain is used in cryptocurrencies, according to data from the EU in previous years it has been successfully applied in the food supply chain. In the Republic of Serbia, the area under organic agriculture amounts to 0.5%, while in the territory of the EU 15, that area is significantly larger and amounts to 18.6%. Non-transparency, high administration and certification costs, and short trust of end customers are the main culprits for the slow expansion of organic agriculture. This can be changed by using Blockchain technology through the creation of electronic databases with the possibility of easy access to all stages of organic production. Control of organic farming will be facilitated and improved, ultimately resulting in a transparent market for organic products in which consumers have full confidence.*

**Key words:** *blockchain technology, digitalization, organic production, Republic of Serbia.*

## INTRODUCTION

Blockchain technology is originally the name given to advanced database mechanism that allows transparent information sharing within a business network. The database stores data in blocks that are lined together in a chain. The technology is related to the digital currency Bitcoin (Ammous, 2016). It is an emerging digital technology which allowing ubiquitous financial transactions among distributes untrusted parties, without the need of intermediaries such as bank (Kamalaris et al.). The key feature of a blockchain is its ability to keep a consistent view and agreement among the participants (i.e., *consensus*) (Bano, 2017), even if some of them might not be honest (Castro & Liskov, 1999).

One of the most common applications of blockchain technology is recognized in agriculture/food production. In agriculture is being used for improving food safety and transaction times. The increasing interest calls for a clear, systematic overview (Bermeo-Almeida et al., 2018). In any nation's economy, agriculture plays an essential role in helping to fees the whole population. The agriculture industry is the main source of labor in most countries (Sajja et al., 2023). Major applications of blockchain are listed as follows: agricultural insurance, smart farming, traceability, land registration, food supply chain, security and safety of farms, e commerce of agricultural products, etc. (Demestichas et al., 2020).

Food is one of the most basic human needs that supplies human body with nutrients that in various metabolic process makes construction of new cells and regeneration. From that point of view agricultural supply chain management is made one of the most complicated and demanding process. The blockchain technology can be used for monitoring the origin of the food and so assist construct reliable chains of food supply and increase customer confidence, especially in organic food production (Kovacevic et al., 2023;). Also, organic food supply chain companies aiming to improve food traceability with blockchain face two key decisions, depending on the characteristics of the organic value chain, regarding (1) optimizing chain partner collaboration and (2) the selection of which data to capture in the blockchain (Van Hilten et al., 2020).

## 1. MATERIAL AND METHODS

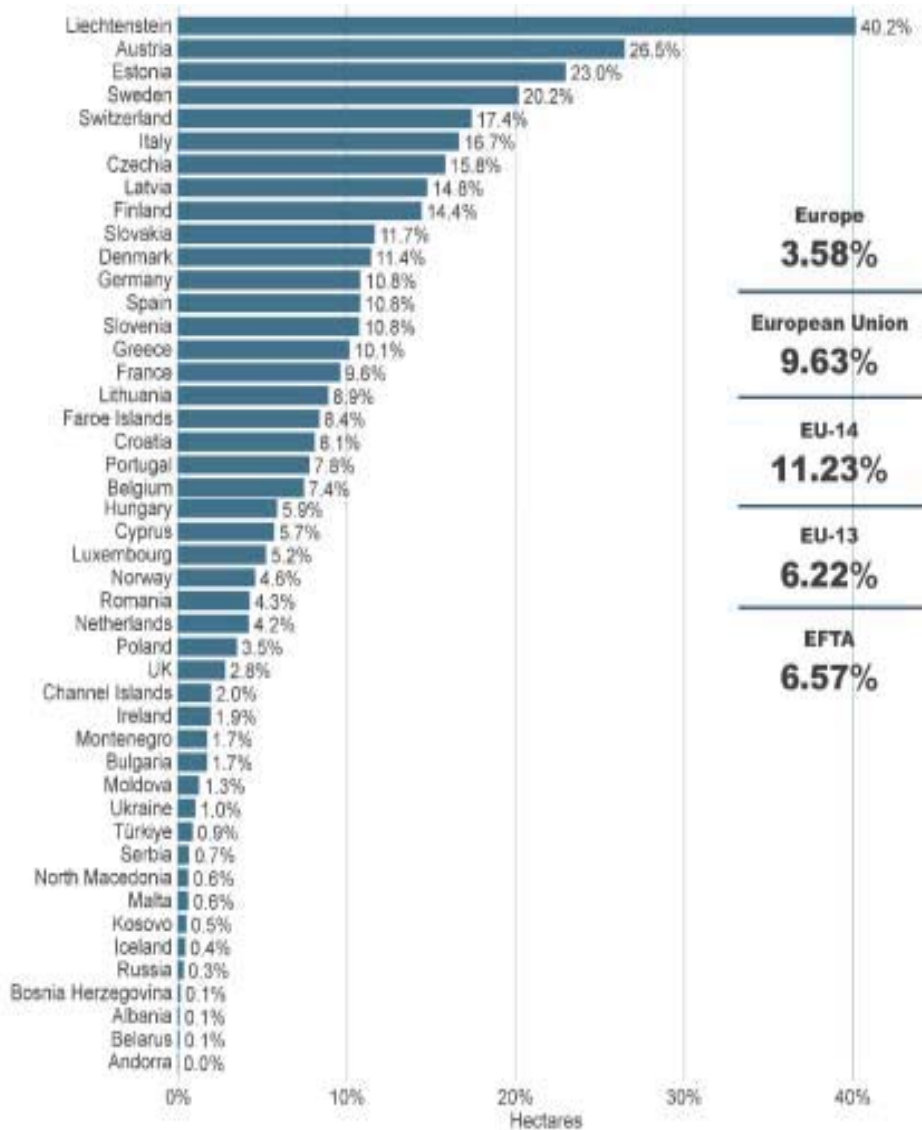
In this paper collected material from scientific research about these relatively new topics, which can be used for improving organic food production in Republic Serbia. The applied methodology relies on intensive literature research with consultation with organic farmers, chain representatives, food processors, certified bodies and institutions, also relies on consultation with experts from field of marketing foodstuff.

## **2. ORGANIC PRODUCTION**

The organic production is a sustainable food production system which is designed to implement all agroecological principles that enable the preservation of human and animal health, environmental protection, and positive impact of society and the ecosystem while achieving significant economic impact benefits (Tegeltija et al., 2022). Organic agriculture has been defined as production focused on reduced input use and the preservation of ecosystems functions (Kovačević, 2021).

In 2021, over 76,4 million hectares of organic agricultural land, including in-conversional areas, were recorded. The regions with largest organic agricultural land areas are Oceania and Europe (17,8 million hectares, 23 %). In territory of EU is recorded 15,6 million ha, and top 3 countries in Europe by organic production are France (2,8 million hectares; Spain with 2,6 million hectares and Italy with 2,2 million hectares). European organic farmland increased by almost 0.8 million hectares. Almost half of the organic farmland is used for arable crops, strong growth of oilseeds (Willer et al., 2023).

**Figure 1.** Organic shares of total agricultural land in 2021 (in %)



Source: Willer et al., 2023

In 2022, the share of agriculture in Serbia's gross domestic product was 6,5% (<https://data.stat.gov.rs>). Organic share of total agricultural land in 2021 in Republic Serbia amounts 0,7%, which is increasing of almost 40% in regards

to 2018, when it was recorded 0,5% of agricultural land under organic production (Figure 1).

Republic Serbia is one of the ten countries with the highest growth in organic agricultural land in percentage in 2021, besides North Macedonia, Bosnia and Herzegovina, Iceland, Cyprus, Romania, Ireland, Luxembourg and Croatia (Figure 2).

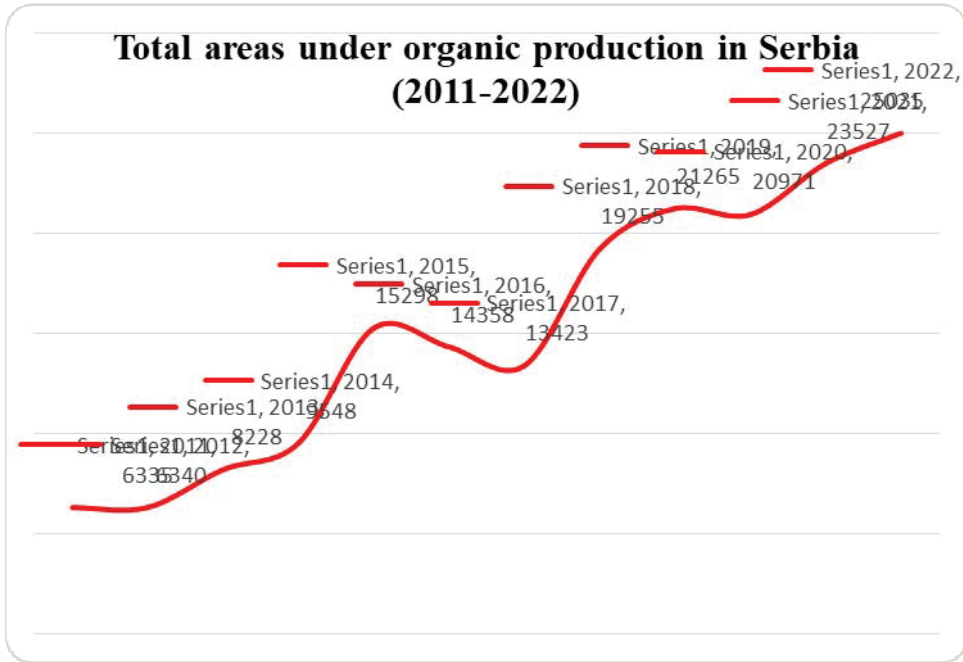
**Figure 2.** The ten countries with the highest growth in organic agricultural land in percentage in 2021



Source: Willer et al., 2023

Organic plant production in Republic Serbia in 2022 takes 25.035 ha, which is for 6,41% highest than total areas under organic production in 2021. For the period 2011-2022., it is noted an almost constant increase in areas, with a small deviation in the period 2015-2017, when the areas under organic production decreased (Graph 1).

**Graph 1.** Total areas under organic production in Serbia (2011-2022)



Source: MAFWRS, 2023

Application of blockchain technology increasing in agriculture in recent years. According to Tripoli et al., 2018, the overlap between agriculture and blockchain architecture is in the following aspects:

- Suppliers put information of the pesticides, fertilizers and used machinery.
- Producers generate information on the farm, farming practices, plant diseases, weather condition animal welfare.
- Information on processing plants.
- Information on transport and storage conditions.
- Retailer information, including information on each foodstuff.



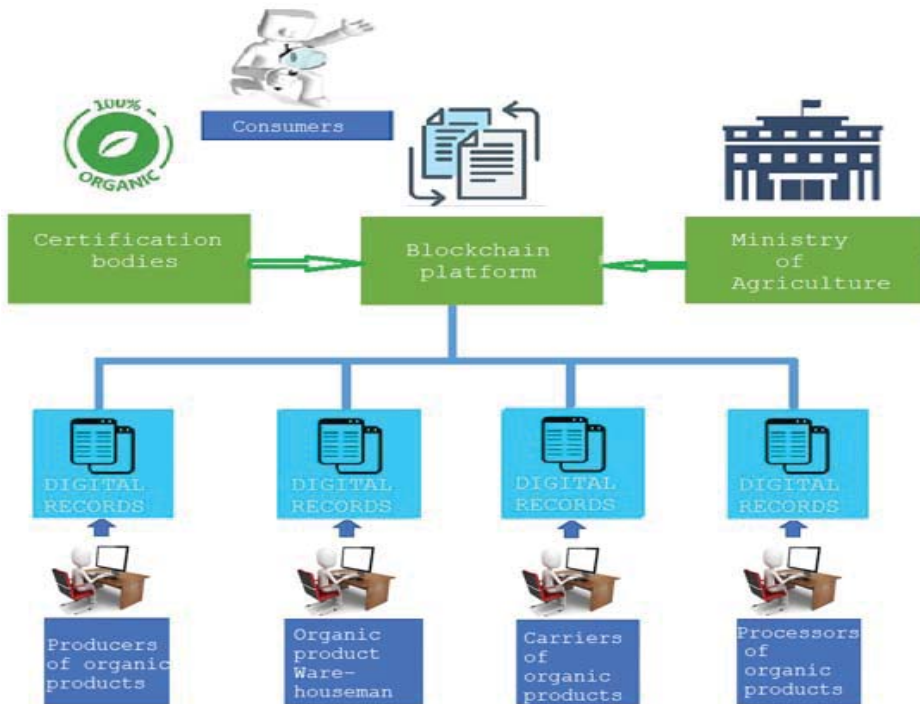
- Blockchain allow consumers to have all information associated with the products, by simply scanning the QR code on packaging.

According to FAO brochure (2020), using of the blockchain technology in agriculture have positive impact on food safety, quality and sustainability; smart contracts enable secure real-time payments; transparent data generated easily accessible to consumers. Other positive impact is seen through providing timely and accurate information by reducing information asymmetry among supply chain actors and real time information and evidence enable better public policy.

### **3. DISCUSSION**

The Common Eu rule for organic agriculture, Regulation (EU) 2018/848 on organic production and labelling of organic products creates a legal field for introduction of the common EU production ledger in Blockchain can be used as opportunity for development of organic production, because there is increasing demands for organic product/foodstuff in EU and in Republic Serbia. In this moment each organic certification body has its own ledger for records of organic production and requirement for a different data format.

### **Figure 3. Blockchain in organic agriculture**



Source: Kovačević et al., 2023

In Figure 3 is present the flow of blockchain applications in organic agriculture. On the presented blockchain schema between organic food producers and final customers are added the following two participants: organic production certification bodies and the institution in charge of organic agriculture supervision (most often the ministries of agriculture).

The blockchain technology in organic production will have significant effect on both supply chain and on organic agriculture policy. The institution that will make supervision can monitor data on production, processing of raw material, transport and storage.

In markets, customers will be able to get all relevant data on organic products via digital online platform (through QR scan). In this way the circle between consumers – organic products – organic producers will be increased.

## CONCLUSION

The future using the blockchain technology in organic production in Republic Serbia will have many positive effects: (1) reducing administrative costs, (2) improving sales conditions, (3) expanding the market, (4) improving the supply chain, and (5) improving payment efficiency and security. This technology can be used to improve agrarian policy that is ongoing in EU and policymakers would be able to monitor the production, processing, transportation and storage of organic products and conduct evidence-based policies. So, there is recommendations that this kind of research should be persuaded in future.

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## **DIGITAL AGE IN DRUG DEVELOPMENT: A REVIEW OF LATEST INDUSTRY GUIDELINES ON RESEARCH DECENTRALIZATION AND ARTIFICIAL INTELLIGENCE**

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**Abstract:** *The clinical trials industry plays a vital role in developing and evaluating new medical treatments, therapies, and interventions. High costs, lengthy processes, and strict regulatory requirements contribute to the burdensome nature of conducting clinical trials. Patient recruitment and retention difficulties and data quality and integrity issues further complicate the process. The COVID-19 pandemic has highlighted the need for alternative approaches, such as decentralized and remote participation, to overcome traditional barriers in clinical trials. Additionally, using artificial intelligence and machine learning (AI/ML) in drug development presents opportunities to enhance the availability of safe and effective drugs, improve health equity, and enable personalized treatments. Regulatory complexities and the importance of maintaining data reliability and security must be considered when implementing AI/ML solutions. This paper provides an overview of the current settings and challenges of the clinical trials industry based on the latest Food and Drug Agency (FDA) guidance, highlighting the need for innovative solutions and a shift towards decentralized and patient-centric approaches in clinical trial design and execution. Paper concludes by emphasizing the potential benefits of AI/ML in drug development and the*

*importance of regulatory compliance and data management through decentralization.*

**Keywords:** *clinical trials, decentralized trials, patient recruitment and retention, data integrity, artificial intelligence, regulatory compliance, digital health technologies.*

## **DIGITALNO DOBA U RAZVOJU NOVIH LEKOVA: PREGLED NAJNOVIJIH SMERNICA INDUSTRIJE O DECENTRALIZACIJI ISTRAŽIVANJA I VEŠTAČKOJ INTELIGENCIJI**

**Apstrakt:** *Industrija kliničkih ispitivanja igra vitalnu ulogu u razvoju i evaluaciji novih medicinskih tretmana, terapija i intervencija. Visoki troškovi, dugotrajni procesi i strogi regulatorni zahtevi doprinose opterećujućoj prirodi sprovođenja kliničkih ispitivanja. Poteškoće u regrutovanju i zadržavanju pacijenata, zajedno sa problemima kvaliteta i integriteta podataka, dodatno komplikuju proces. Pandemija COVID-19 istakla je potrebu za alternativnim pristupima, kao što je decentralizovano i daljinsko učešće, kako bi se prevazišle tradicionalne barijere u kliničkim ispitivanjima. Pored toga, korišćenje veštačke inteligencije i mašinskog učenja u razvoju lekova predstavlja mogućnosti da se poveća dostupnost bezbednih i efikasnih lekova, poboljša zdravstvena jednakost i omogući personalizovani tretman. Regulatorna složenost i važnost održavanja pouzdanosti i sigurnosti podataka moraju se uzeti u obzir prilikom implementacije rešenja veštačke inteligencije. Ovaj rad daje pregled trenutnih postavki i izazova industrije kliničkih ispitivanja, baziranih na najnovijim vodičima Agencije za hranu i lekove iz SAD (FDA), naglašavajući potrebu za inovativnim rešenjima i pomeranjem ka decentralizovanim pristupima usredsređenim na pacijenta u dizajnu i izvođenju kliničkih ispitivanja. U radu se zaključuje sa potencijalnim prednostima veštačke itneligencije u razvoju lekova i važnosti usklađenosti sa propisima i upravljanja podacima kroz decentralizaciju.*

**Ključne reči:** *klinička ispitivanja, decentralizovana ispitivanja, regrutovanje i zadržavanje pacijenata, veštačka inteligencija, usklađenost sa propisima, digitalne zdravstvene tehnologije.*

### **INTRODUCTION**

The clinical trials industry is crucial in developing and evaluating new medical treatments, therapies, and interventions. It serves as a vital bridge

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between scientific research and the availability of safe and effective treatments for patients. However, the industry faces several challenges that impact its efficiency and effectiveness. One significant challenge is the high cost and time-intensive nature of clinical trials. According to a study published in the *Journal of Health Economics*, the average cost of bringing a new drug to market exceeds \$2.5 billion. [1] The lengthy process of conducting trials, obtaining regulatory approvals, and ensuring patient safety adds to the overall time and financial burden. Another challenge is patient recruitment and retention. Clinical trials heavily rely on recruiting sufficient eligible participants within a specific timeframe. However, recruitment difficulties often arise due to strict eligibility criteria, limited awareness among potential participants, and patient reluctance to participate in experimental treatments. Retaining participants throughout the trial duration is equally essential. However, it can be challenging due to various factors such as treatment burden, adverse events, and participant dropouts. [2] Ensuring data quality and integrity is a critical challenge in the clinical trials industry. Data management, including accurate data collection, analysis, and reporting, is essential for drawing valid conclusions and making informed decisions. However, inconsistencies, missing data, and errors can occur, potentially compromising the reliability and validity of trial results. Maintaining data integrity requires robust systems and processes, adherence to regulatory guidelines, and effective monitoring and auditing. Regulatory compliance is another significant aspect of clinical trials. Strict regulatory requirements are in place to ensure participant safety, ethical conduct, and the validity of trial results. Compliance with complex regulatory frameworks, such as Good Clinical Practice (GCP) guidelines, can be challenging, especially for multinational trials across different jurisdictions. Non-compliance can lead to delays, penalties, and even the termination of trials.

Traditional clinical trial settings often require participants to visit physical trial sites, which can be inconvenient and burdensome, particularly for individuals with limited mobility or those residing in remote areas. The COVID-19 pandemic has further emphasized the need for alternative approaches that reduce the reliance on in-person visits and enable remote participation. [3] Data management and integration pose challenges in clinical trials. With the growing use of digital health technologies and decentralized trial models, diverse data sources need to be collected, stored, and analyzed efficiently while maintaining data security and privacy. [4] Finally, regulatory complexities and compliance requirements present

significant challenges in conducting clinical trials. Researchers and sponsors must navigate a complex web of regulations, guidelines, and ethical considerations to ensure adherence to standards and protect the rights and safety of participants. [5]

Addressing these challenges requires innovative solutions and a shift towards decentralized and patient-centric approaches in clinical trial design and execution. Embracing digital health technologies, optimizing recruitment strategies, streamlining data management processes, and fostering collaboration among stakeholders can contribute to overcoming these obstacles and advancing clinical research.

In this research, we have presented important considerations related to the newest regulatory approaches of the Food and Drug Agency, USA, issued in May 2023 in addition to previous complementary research for conducting clinical trials in digital settings using A.I. and how the diversity in clinical trials should be approached in the latest industry settings.

This is important landscape for global industry development and regulatory views on digital technologies as FDA is leading global institution and clinical research are very sophisticated and innovative industry. Having this said, we can expect in future that all other industries might take over those considerations, adopt for specific industry and develop them further to achieve industry technological brake through. Therefore, attention to this review would be required whether we are involved in drug development processes or in any other industry.

## **INDUSTRY BACKGROUND**

To fulfil its mission of protecting, promoting, and advancing public health, the Food and Drug Administration's (FDA's) Center for Drug Evaluation and Research (CDER), in collaboration with the Center for Biologics Evaluation and Research (CBER) and the Center for Devices and Radiological Health (CDRH), including the Digital Health Center of Excellence (DHCoE), published guide to facilitate a discussion with stakeholders on the use of artificial intelligence (A.I.) and machine learning (ML) in drugs development, including medical devices used with drugs, to inform the regulatory landscape in this area. [6] FDA ensures drug safety and effectiveness while encouraging innovation. [7] Recent technological advancements in data collection and generation, information management, and computing can transform drug development. This ecosystem presents



unique opportunities and challenges, and FDA collaborates with domestic and international partners to maximize the benefits of these innovations.[1] Stakeholders, including developers, manufacturers, regulators, and academic groups, are working together to understand the applications of AI/ML in drug development.[1] By definition, A.I. is a branch of computer science that utilizes algorithms to perform tasks, while ML is a subset of A.I. that develops models through data analysis. [1]

AI/ML can enhance drug development by expediting safe and effective drug availability, improving health equity, enhancing manufacturing quality, ensuring drug safety, and enabling personalized treatment. The discussion paper acknowledges that it is not FDA guidance or policy but rather an opportunity for stakeholders, including researchers and technology developers, to learn and discuss the utilization of AI/ML in drug development. It provides an initial understanding of the considerations involved, including familiarity with FDA activities and regulations. The paper also explores considerations for responsible AI/ML utilization in drug development, highlighting efforts to establish general principles and standards. Considering the diverse nature of AI/ML applications, a risk-based approach is advocated to facilitate innovation and protect public health. The ongoing engagement between FDA and stakeholders aims to establish a shared understanding of rapidly evolving AI/ML systems and their potential in drug development. AI/ML finds applications in various phases of drug development, from drug discovery to postmarket safety surveillance and manufacturing. These applications are not exhaustive, and FDA oversight may or may not be applicable in specific cases.

## **INDUSTRY SETTINGS FOR A.I. / MACHINE LEARNING USE**

The early stages of drug development generally rely on identifying a suitable biological target for drug candidates. AI/ML can be utilized to analyze and synthesize important information from existing scientific research and other data sources to inform biological target selection. AI/ML approaches can mine and analyze complex datasets to predict the structure and function of biological targets, helping in understanding their role in disease pathways[8][9][10]. However, subsequent studies are necessary to validate the role of the identified targets. [1]

The discovery of potential drug candidates involves screening compound libraries and refining compounds' specificity and selectivity for biological targets. AI/ML can predict chemical properties, bioactivity, efficacy, and

potential adverse events of compounds, aiding in compound screening and design. [11] AI/ML can also assist in predicting drug-target interactions, potentially guiding drug repurposing efforts and *de novo* drug design. [12] Furthermore, the availability of real-world data (RWD) from various sources enables AI/ML to identify previously unknown effects of drugs on disease pathways.



Nonclinical research involves *in vitro* and *in vivo* studies to advance potential therapeutics. AI/ML, including computational modelling and simulation techniques, can be applied to analyze data from pharmacokinetic, pharmacodynamic, and toxicologic studies, explore mechanistic models, and

develop predictive models. [13] Physiologically-based pharmacokinetic (PBPK) and physiologically-based PK/PD (PBPK-PD) modelling, along with novel AI/ML algorithms, are being explored for nonclinical applications, potentially improving accuracy in complex data analysis. [14]

AI/ML plays a significant role in streamlining and advancing clinical research. It can assist in patient recruitment, stratification, monitoring, and predicting treatment responses and adverse events. AI/ML algorithms can also analyze electronic health records (EHRs) and other patient data sources to identify relevant cohorts and extract valuable insights. AI/ML's potential to optimize clinical trial design and conduct promises to improve efficiency and patient outcomes in drug development. For example, AI/ML is being utilized to analyze vast amounts of data from both interventional studies (also referred to as clinical trials) and non-interventional studies (also referred to as observational studies) to make inferences regarding the safety and effectiveness of drugs. Additionally, AI/ML has the potential to inform the design and efficiency of non-traditional trials, such as decentralized clinical trials and trials incorporating the use of real-world data (RWD) extracted from electronic health records (EHRs), medical claims, or other data sources. AI/ML may also have a role in analyzing and interpreting data collected from digital health technologies (DHTs) used in clinical studies. Finally, AI/ML could also be used to improve the conduct of clinical trials and increase operational efficiency. The following subsections will highlight some of the uses and potential uses of AI/ML during the design and conduct of clinical research.

AI/ML is increasingly being developed and used to connect individuals to trials for investigational treatments from which participants may benefit. Specifically, AI/ML is being used to mine vast amounts of data, such as data from clinical trial databases, trial announcements, social media, medical literature, registries, and structured and unstructured data in EHRs, which can be used to match individuals to trials. [15] While these algorithms are trained on high volumes of patient data and enrolment criteria from past trials, it is essential to ensure adequate representation of populations that are likely to use the drug (e.g., gender, race, and ethnicity) as matching algorithms are created and, when used, to confirm that equitable inclusion was achieved during the recruitment process. In the future, if properly validated, these technologies may continue to play an increasing role in matching individuals with investigational treatments.

Enrichment strategies can aid participant selection in clinical investigations designed to demonstrate the effectiveness of drug and biological products.

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AI/ML has been explored and used as part of a clinical investigation in the prediction of an individual participant's clinical outcome based on baseline characteristics (e.g., demographic information, clinical data, vital signs, labs, medical imaging data, and genomic data). [16] Such predictive models can be used to enrich clinical trials (e.g., identifying high-risk participants or participants more likely to respond to the treatment). When these types of AI/ML algorithms are used for patient evaluation and selection before randomization, it may be possible to reduce variability and increase study power. [17]

In addition to utilization in enrichment strategies, such predictive models can also be used for participant stratification, for example, if an AI/ML model could predict the probability of a serious adverse event before an investigational treatment is administered. Then, based on their predicted risk for these serious adverse events, participants can be stratified into different groups and then monitored accordingly (or excluded depending on the predicted severity of the adverse event).

AI/ML can characterize and predict pharmacokinetic (P.K.) profiles after drug administration. Considering confounding factors, it can also be used to study the relationship between drug exposure and response. These kinds of models can be used to optimize the dose/dosing regimen selection for a study. [18] AI/ML can be utilized to analyze the large and diverse data generated from continuously monitoring persons using these technologies. This could include using AI/ML to aid in the evaluation of multimodal data and composite measures that may combine individual measures collected through multiple digital health technologies (DHTs). [19] AI/ML can be used for a range of data cleaning and curation purposes, including duplicate participant detection and imputation of missing data values, as well as the ability to harmonize controlled terminology across drug development programs. [20] Use of AI/ML could also significantly enhance data integration efforts by using supervised and unsupervised learning to help integrate data submitted in various formats and perform data quality assessments. Additionally, AI/ML can be used for data curation via masking and de-identifying personally identifiable information, creating metadata, and searching and retrieving stored data. These applications can increase data accuracy and improve the speed at which data are prepared for analysis. AI/ML has been used to analyze high volumes of diverse and complex real-world data (RWD) extracted from electronic health records (EHRs), medical claims, and disease registries, among other sources. Additionally, the use of AI/ML in predictive modelling and counterfactual simulation to inform

clinical trial designs is being actively explored. For example, *in silico* clinical trials utilize computational modelling and simulation to evaluate drug candidates using a virtual cohort of simulated participants with realistic variability of traits representing the desired participant population. [21] AI/ML could be employed in these situations to aid in evaluating a vast number of counterfactual simulations and to predict trial outcomes before human trials. At an even more personalized level, AI/ML can also be used in the context of digital twins of patients, an emerging method that could potentially be used in clinical research. To create digital twins of patients, AI/ML can be utilized to build *in silico* representations or replicas of an individual that can dynamically reflect molecular and physiological status over time. [22] Compared to a participant in a clinical trial that received an investigational treatment, the digital twin could potentially provide a comprehensive, longitudinal, and computationally generated clinical record that describes what may have happened to that specific participant if they had received a placebo.

## **DECENTRALIZATION IN DIGITALIZED CLINICAL RESEARCH**

In the following text, we will present views of the FDA on several major topics, such as Decentralized Clinical Trial (DCT), which represent a clinical trial where trial-related activities occur at locations other than traditional clinical trial sites; Digital Health Technology (DHT), representing a system utilizing computing platforms, connectivity, software, and sensors for healthcare and related purposes. DHT technologies encompass various applications, from general wellness to medical device use. They include technologies designed for medical product use and those used in conjunction with other medical products (devices, drugs, and biologics). DHTs may also be employed in the development and study of medical products. In addition to this, Investigational Product (I.P.) refers to human drugs, biological products, or devices that are undergoing investigation in a clinical trial, and telehealth represents the utilization of electronic information and telecommunications technologies to support and facilitate long-distance clinical healthcare. [23]

In fully decentralized clinical trials, trial activities occur at locations other than traditional trial sites, such as participants' homes or local healthcare facilities. Decentralized hybrid trials combine in-person visits to traditional trial sites with activities conducted at non-traditional locations. The FDA's

regulatory requirements for investigations of medical products are the same for decentralized clinical trials (DCTs) and traditional site-based trials.

Clinical trials already include decentralized elements where certain activities involving participants occur outside traditional trial sites. For instance, laboratory tests are often conducted at remote clinical laboratory facilities. DCTs can improve access to diverse patient populations and enhance trial efficiencies. Advances in telehealth and digital health technologies allow for fewer in-person visits and the collection of trial-related data remotely. This convenience benefits participants, reduces caregiver burden, and facilitates research on rare diseases and populations with limited mobility or access to traditional trial sites. Decentralized trials can enhance a diverse clinical population's engagement, recruitment, enrolment, and retention. Fully decentralized trials are suitable for investigational products that are easy to administer, have well-characterized safety profiles, and do not require complex medical assessments. Hybrid decentralized trials are more appropriate when specific assessments or I.P. administration need to occur at a clinical trial site, while others can be conducted remotely.

Challenges associated with DCTs include coordinating trial activities across multiple non-traditional locations. DCTs require specific plans to facilitate decentralization, including using local healthcare facilities, healthcare providers, clinical laboratory facilities, home visits, and direct distribution of investigational products to participants at their locations. Appropriate training, oversight, and risk assessment should be in place.

In a DCT, trial-related activities occur at locations other than traditional sites and involve a network of locations. For inspection purposes, there should be a physical location where trial records are accessible, and interviews can be conducted. The variability and precision of data obtained in DCTs may differ from traditional site-based trials, which can impact the validity of non-inferiority findings. Remote assessments may introduce variability, including those performed by trial participants or local healthcare providers. Calculating non-inferiority margins in DCTs may pose challenges, and FDA review divisions should be consulted in planning non-inferiority trials in a DCT setting.

In-person visits and trial-related activities can be conducted by trial personnel who are sent to participants' homes or preferred locations. [24] Depending on the trial protocol, in-person visits and trial-related activities may also be conducted by healthcare providers (HCPs) who are located close to trial participants' homes but are not part of the trial

personnel. These local HCPs, such as doctors or nurses, may be used by sponsors or investigators to perform trial-related activities fee-for-service. The trial-related services they provide should align with their qualifications in clinical practice, such as performing physical examinations, reading radiographs, and obtaining vital signs, without requiring detailed knowledge of the trial protocol or investigational product (I.P.). [25]

However, trial-related activities that are unique to research and require detailed knowledge of the protocol or the I.P. should be performed by qualified trial personnel who have received appropriate training. Both trial personnel and trial participants, when applicable, should be trained on how to conduct or participate in a telehealth visit. During each remote trial visit, investigators should confirm the participant's identity. The FDA does not endorse any specific identification method, but sponsors and investigators can refer to existing digital identity guidelines. [26]

Case report forms and other documentation should be completed for telehealth visits, including recording the visit's date, time, and location. [27] The trial protocol should specify how remotely identified adverse events will be evaluated and managed. Additionally, it is the responsibility of the sponsor and investigator to ensure that remote clinical trial visits conducted via telehealth comply with the relevant laws governing telehealth in the applicable U.S. states or territories and other countries. [27]

Digital Health Technologies (DHTs) enable remote data transmission from trial participants regardless of location.[27] Sponsors should consider the guidance provided by the FDA on using DHTs in clinical investigations, which includes recommendations for selecting and validating DHTs, collecting data remotely, training on their use, and managing risks associated with their use in clinical trials.

The roles and responsibilities of sponsors and investigators in DCTs are related to ensuring proper coordination of decentralized activities and strive for diversity and inclusiveness in trial populations. They can utilize local healthcare institutions for outreach and consider bringing trial-related activities to participants' homes through DHTs to improve engagement, recruitment, and retention, particularly for individuals facing challenges accessing traditional clinical trial sites. The use of local HCPs close to potential participants' homes can also enhance the engagement and recruitment of diverse participants while reducing cultural or linguistic barriers to participation [27].

Sponsors must include a data management plan (DMP) in the trial protocol, specifying data origin, flow, and acquisition methods from various sources. The DMP should identify vendors for data collection, handling, and management. Operational aspects of the DCT, such as scheduled and unscheduled clinical trial visits, transmission of reports, delivery of investigational products, safety monitoring, and management of adverse events, should be described in the trial protocol. Case report forms should include information about when and where data were collected and by whom. Sponsors must comply with relevant local laws, regulations, and licensing requirements regarding medical practice and I.P. administration during DCTs. Proper investigation monitoring should also be ensured, employing risk-based approaches based on the sponsor's assessment [27].

### **SOFTWARE USED IN CONDUCTING DIVERSIFIED CLINICAL TRIALS (DCTs)**

Software programs used to produce and process trial records are subject to 21 CFR part 11, which sets forth the requirements for electronic records and electronic signatures in the United States. [28] These programs must ensure data reliability, security, privacy, and confidentiality. The FDA's regulations on electronic records and signatures aim to ensure the integrity and trustworthiness of electronic data in clinical trials. Compliance with 21 CFR part 11 is crucial for maintaining data integrity and meeting regulatory standards. [29] The FDA considers real-time video interactions, telehealth, and live information exchanges between trial personnel and participants. As such, they are not considered electronic records and are not subject to 21 CFR part 11. However, local laws governing telehealth may apply. Privacy and security should be ensured during real-time visits, which must be appropriately documented. Suppose this documentation is captured in electronic form. In that case, it is subject to 21 CFR part 11. [30] When using software solutions, clinical research sponsors should consider the following aspects concerning software implemented in decentralized clinical trials (DCTs). The software used to support DCT operations can be executed on various platforms, such as tablets, cell phones, and personal computers. It serves multiple functions, including managing electronic informed consent, capturing and storing reports, managing electronic case report forms (eCRFs), scheduling trial visits, tracking investigational products (I.P.s), syncing information recorded by digital health technologies (DHTs), and serving as communication tools between DCT personnel and trial participants. [31]



## CONCLUSION

The clinical trials industry is critical in advancing medical treatments and therapies, but it faces various challenges that impact its efficiency and effectiveness. The high cost and time-intensive nature of conducting trials, patient recruitment and retention difficulties, data quality and integrity issues, and regulatory compliance complexities are among the significant challenges faced by the industry. These challenges hinder the timely availability of safe and effective patient treatments and necessitate innovative solutions.

The COVID-19 pandemic has underlined the need for alternative approaches in clinical trials, such as decentralized and remote participation, to overcome traditional barriers. Digital health technologies and decentralized trial models offer opportunities to reduce the reliance on in-person visits, improve participant engagement, and collect diverse data sources more efficiently while ensuring data security and privacy. However, navigating the regulatory landscape and ensuring compliance with complex frameworks remain critical considerations for researchers and sponsors.

Artificial intelligence and machine learning (AI/ML) in drug development holds excellent potential for expediting the availability of safe and effective drugs, enhancing health equity, improving manufacturing quality, ensuring drug safety, and enabling personalized treatments. Therefore, the FDA recognizes the opportunities and challenges associated with AI/ML in drug development and actively invites feedback from stakeholders to establish a shared understanding and facilitate responsible utilization.

Furthermore, the FDA acknowledges the importance of software programs in producing and processing trial records, emphasizing compliance with 21 CFR part 11 to ensure data reliability, security, and confidentiality. Real-time video interactions, including telehealth, are considered live information exchanges and are not subject to 21 CFR part 11. However, privacy, security, and appropriate documentation during real-time visits are crucial considerations. Addressing the challenges faced by the clinical trials industry requires embracing innovative approaches, leveraging digital health technologies, streamlining data management processes, ensuring regulatory compliance, and fostering collaboration among stakeholders. By doing so,

the industry can advance the field of clinical research, accelerate the development of new treatments, and improve patient outcomes.

The landscape of global industry development and regulatory views on digital technologies is of significant importance. As a leading global institution, the FDA plays a crucial role in shaping the future of clinical research, which is a highly sophisticated and innovative industry. The advancements and considerations made in this field have far-reaching implications, not only for drug development but also for other industries. It is anticipated that these considerations will serve as a catalyst for technological breakthroughs across various sectors. Therefore, it is imperative to pay attention to these developments, regardless of our involvement in drug development processes. The insights gained from the FDA's efforts can pave the way for innovation and progress in various industries, setting a precedent for the adoption and further development of digital technologies.

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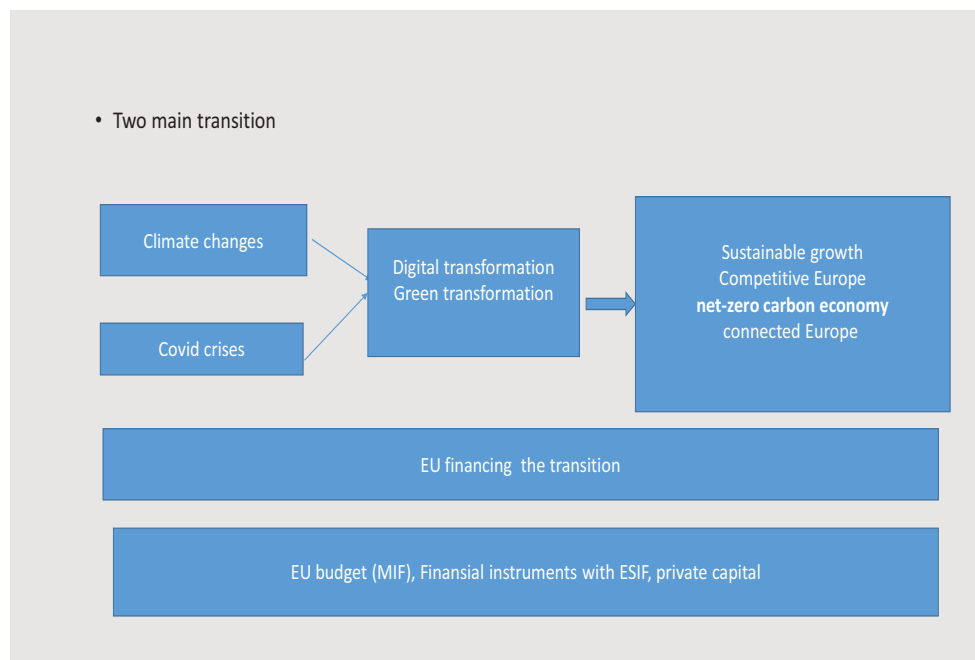
## FINANCIAL FRAMEWORK TOWARDS GREEN AND DIGITAL TRANSFORMATION – CHALLENGES AND FUTURE

*Prof. Svetlana Aleksandrova*

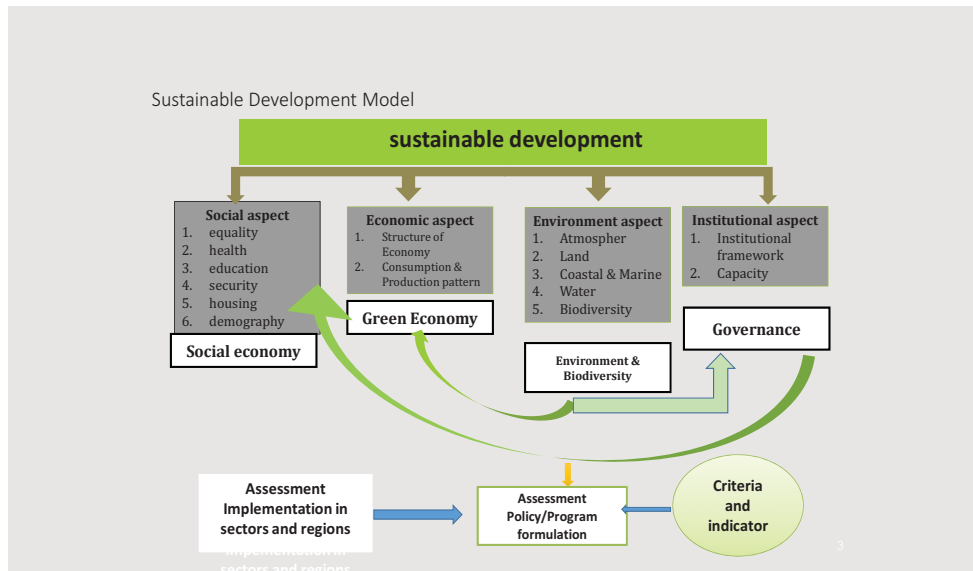
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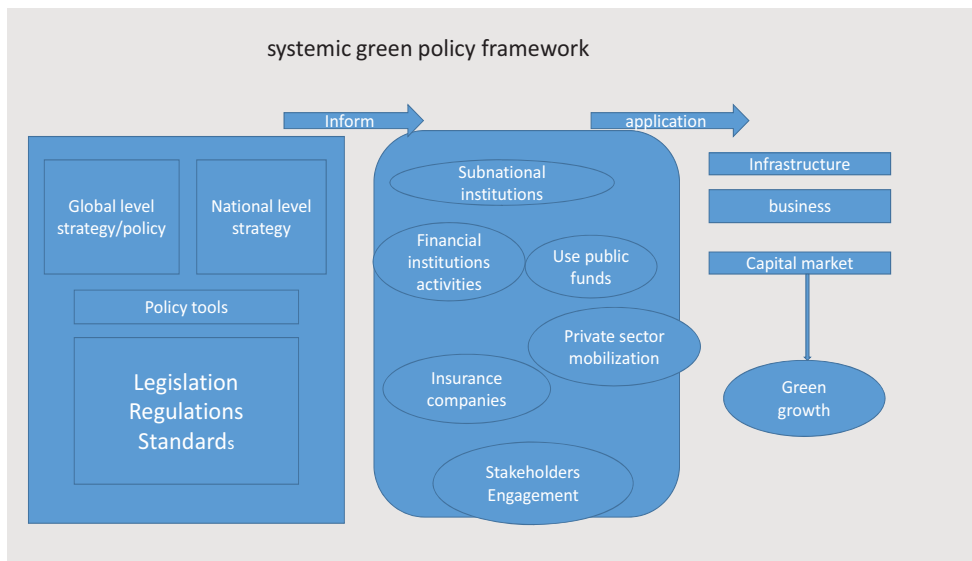
### Two main transitions



## Sustainable Development Model



## National Recovery and Resilience Plan



## Financial instruments

Financial instruments

- co-funded by the ESIF (combined EU, national and private resources) provide support to not generate sufficient returns but expected to be financially viable in the long run.
- a sustainable and efficient way to invest
- -revolving effect- additional flow of money
- Leverage effect - attract additional public and private resources
- high –risk projects

Invest EU Fund

Loans

Risk sharing

Guarantee

Equity

Green bonds

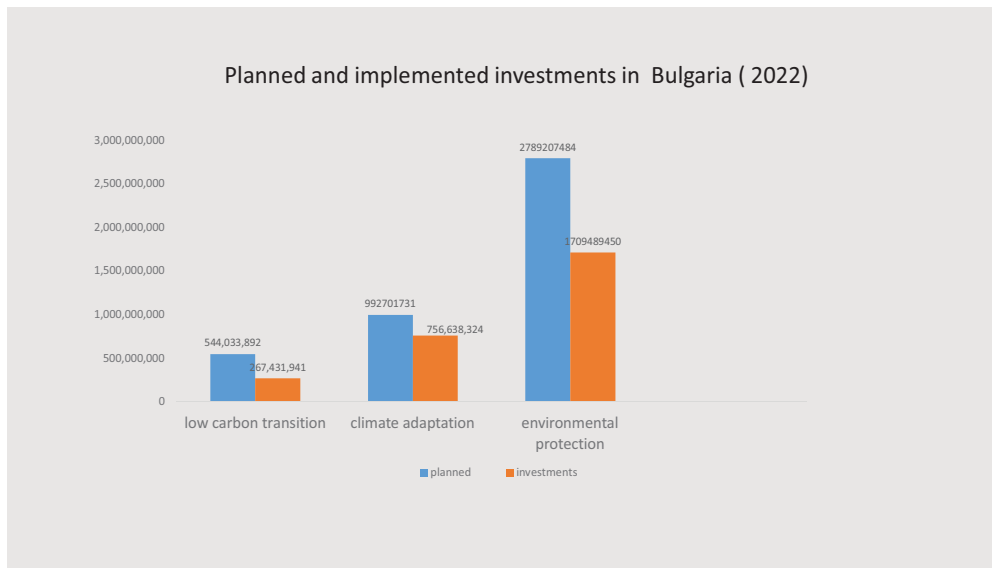
Global funds

Investment funds

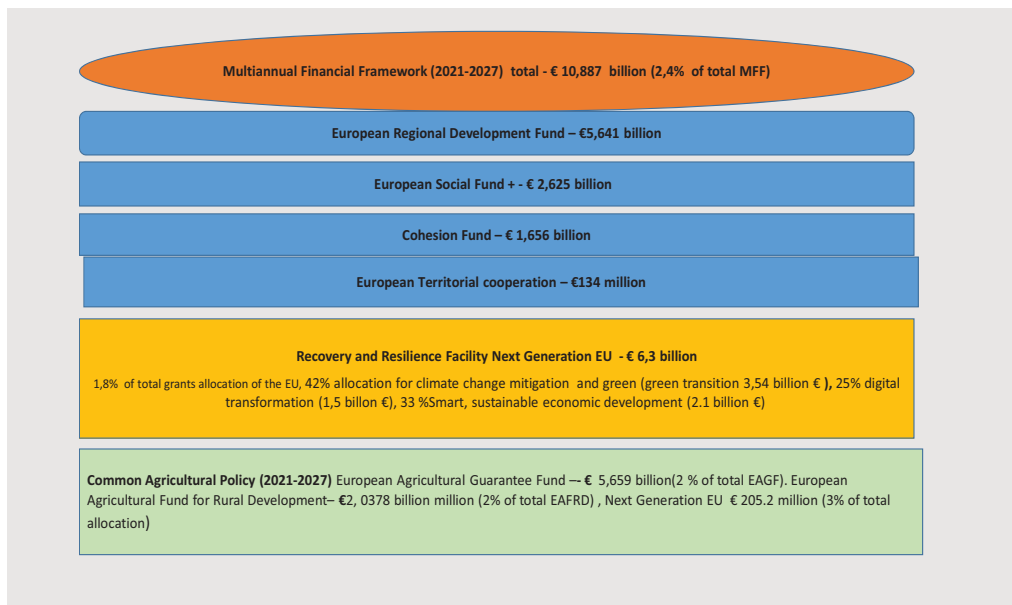
**Focus areas** –digitalization, innovation, research, energy efficiency, green transformation etc.

## Planned and implemented investments in Bulgaria (2022)





## Multiannual Financial Framework



## National Recovery and Resilience Plan

### National Recovery and Resilience Plan

#### Green economy

- Investments (**€1.7 billion**) in renewable energy sources, electricity storage
- energy-efficiency renovation of the building stock (over **€1 billion**).
- Transport decarbonisation (**666 million**) - electric rolling stock for sub-urban and inter-regional rail transport; the construction of a new section of the Sofia metro; sustainable urban mobility pilot scheme with purchase of zero-emission public transport vehicles and charging station infrastructure.
- biodiversity aim to protect and restore ecosystems and natural habitats and species (**€48 million**).

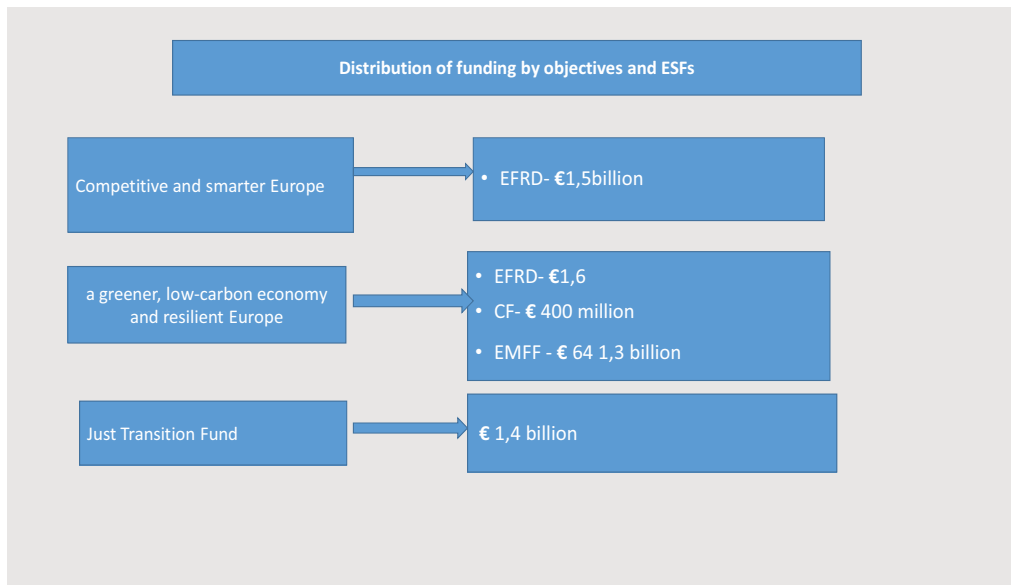
#### Digital economy

- Investment in rural and sparsely populated areas (**€270 million**).
- Investments to enhance digital skills (**€319 million**).
- digitalisation of public administration (**€297 million**).
- Investments supporting the digitalisation of businesses (**€15.7 million**), as well as of the transport (**€202.6 million**) and energy sectors (**€75.7 million**).

#### Social and economic development (2.1 billion €)

- technological modernisation of SMEs and mid-caps, notably their green and digital transitions (**€801 million**).
- modernising education and enhancing research and innovation (**€748 million**).
- Provision of employment and social service (**€440 million**).
- access to healthcare (**€372 million**).

### Distribution of funding by objectives and ESFs



### **Green economy**

Investments (**€1.7 billion**) in renewable energy sources, electricity storage

Energy-efficiency renovation of the building stock (over **€1 billion**).

Transport decarbonisation (**666 million**) - electric rolling stock for sub-urban and inter-regional rail transport; the construction of a new section of the Sofia metro; sustainable urban mobility pilot scheme with purchase of zero-emission public transport vehicles and charging station infrastructure.

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Investments supporting the digitalisation of businesses (**€15.7 million**), as well as of the transport (**€202.6 million**) and energy sectors (**€75.7 million**).

### **Social and economic development (2.1 billion €)**

- Technological modernisation of SMEs and mid-caps, notably their green and digital transitions (**€801 million**).
- Modernising education and enhancing research and innovation (**€748 million**).
- Provision of employment and social service (**€440 million**).
- Access to healthcare (**€372 million**).

### **Invest EU - Direct access to the EU guarantee**

**Single programme:** a single Regulation and agreement with implementing and advisory partners

**Budgetary guarantee:** no funded instruments

Synergies with structural funds and with RRF

**Blending:** harmonised combination rules

**Access to financial instruments** supported by the budgetary guarantee available on a competitive basis and in market driven manner

**Single fund** bringing together the many different EU-level financial instruments

**EU budgetary guarantee** (EU compartment) EUR 26.2 bn

**Additional investment across Europe** - mobilise EUR 370 bn in

### **Invest EU (investment support in Bulgaria)**

#### **Direct financing with a guarantee under Invest EU (agreement BBD and EIB)**

- Lending (reduced collateral requirements and a preferential interest rate), three directions: "Competitiveness of SMEs", "Sustainability" and "Innovations and digitalization"
- Funding project implementation
- Acquisition of machinery and equipment by leasing

#### **Blending finance ( financial instrument +grant)**

- Competitiveness, innovation SME (**loan** guarantee scheme, portfolio-guarantee, risk –sharing credit, equity and venture finance)

-Urban and regional infrastructure projects (loans and guarantee scheme)

-Social entrepreneurship, small business (micro-lending, first -loss)

- Support economic development of rural areas and improve the competitiveness of the agricultural sector (Investment loans, working capital)

### **Financial framework benefits**

Mobilization of private resources (Leverage effect)

Improves the sustainability of business (green and digital actions)

Blending finance -an alternative to traditional financing, identified investment by the financial instruments within national programs

Financing large-scale investment projects, and enables the sharing of financial risks between the public and private sectors, i.e. is a form of public-private partnership

Increase access to finance for SMEs and small mid-caps through debt and equity products

Supporting businesses with problems of access to finance: start-ups, younger and smaller companies

Promoting digitalization, uptake of innovation, and cultural and creative industries;

The financial sector is prepared to finance green and sustainable projects;

Loans continue to represent the highest share of financial instruments (53% of all commitments)

Financial support delivered through investment funds (portfolios)

### **Risks**

The possibility that finance becomes too concentrated on certain sectors;

Inefficiencies in the way in which private investment is incentivized;

Assessment of the financial gap;

Changes of regulations – uncertainty in investment decisions;

Build portfolios for lending to risky activities;

Mistrust to financial instruments;

Estimating the appropriate cap, or maximum limit, can be challenging.

Centralized management of financial instruments, more time consuming and more costs;

The guarantee represents a risk reserve for the lender and does not provide liquidity;

Compared to debt instruments, equity can be less attractive.



## SESSION NO. 1/PRVA SESIJA

# INCORPORATION OF COMPETENCY-BASED LEARNING ELEMENTS IN THE TEACHING PROCESS AS AN OUTCOME OF *COVID-19* PANDEMIC

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## INTRODUCTION

Competency-based education (CBE) is a new concept of learning that involves defining competencies (i.e., objectives) that must be attained at the end of the student knowledge assessment process in study programs (C-BEN, n.d.). Identification of competencies is a common part of the learning programs and curricula at accredited universities. In addition to competencies, the program also states the means of achieving competencies and the level of attained competencies according to predetermined criteria, usually the Bloom taxonomy (Armstrong, 2010). In most cases, the means of achieving competencies are traditional ways of teaching and learning. Assessment of competencies is performed through the formal process by assessing midterm exams and seminar papers, as well as the final exam at the end of the semester.

The COVID-19 pandemic period forcefully changed the teaching and learning models in a very short period of time. Educators were under severe pressure to develop new models to enable students to gain theoretical knowledge and adequate competencies defined by the educational program.



Traditional classroom models and verbal and especially non-verbal communication were forcefully abandoned, while new ways of teaching and learning were being developed on a day-to-day basis. The outcome of these processes and transformations was the improvement of definitions of the goals and objectives of the study program according to CBE principles for *Clear, Measurable, Meaningful, and Integrated Competencies* (C-BEN, 2017).

The aim of this article is to present the transformation of the traditional teaching and learning process to the online model, which was developed as a result of the COVID-19 breakout. The case study looks into the course Financial Reporting, which is incorporated in the study program Accounting and Auditing at Faculty of Finance, Banking, and Auditing at ALFA BK University in Belgrade.

## **METHODOLOGY**

The measurement standard for the analysis of the effects of the course modification is the Quality Framework for Competency-Based Education Programs published by the Competency-Based Education Network (Quality Framework) (C-BEN, 2017). The Quality Framework consists of eight elements of quality. The modification of means and elements in the study program mainly relates to the second element which is known as *Clear, Measurable, Meaningful and Integrated Competencies*.

The teaching and learning process during the COVID-19 period required more flexibility in terms of learning space, learning time, learning tools, and, finally, the assessment process, which were crucial elements to consider during the COVID breakout period.

To assess the modification of the teaching and learning process during this period, the author compared the means and elements of classroom-based teaching and learning, commonly in use before COVID-19, and online teaching and learning, commonly in use during COVID-19.

## **STUDY PROGRAM IN A PRE-COVID-19 ENVIRONMENT**

The primary goals of the undergraduate four-year study program Accounting and Auditing are: providing knowledge and understanding about accounting and auditing in business management of an organization and their role in corporate governance; providing professional knowledge in various

accounting fields, such as financial reporting, cost accounting, management accounting, financial analysis, auditing of financial statements and similar; to help students apply the concepts of accounting theory in business and in making business policies and decisions; to provide students with the necessary professional and technical skills for career development in accounting and auditing or other jobs; to enable students to have their exams recognized by the Chamber of Certified Auditors, as well as international organizations of accountants and auditors that issue certificates of professional qualifications, accepted by the Chamber of Certified Auditors.

This case study refers to the course Financial Reporting, which students have in their third year of studies and which is incorporated into the Accounting and Auditing study program. The main objective of the course is to understand various aspects of financial reporting in the international environment. The course is designed to enable students to understand the importance of reporting in accordance with International Financial Reporting Standards (IFRS), to attain a basic knowledge of the principles of financial reporting, and to identify standards relevant to the most common positions in the financial statements. The specific objective of the course is to enable students to familiarize themselves with examples of best practices in financial reporting.

The desired learning outcome of this course implies an understanding of the goals and scope of the selected international financial reporting standards, key concepts and definitions, accounting policies, and the application of the knowledge attained in reading and analyzing financial statements. Students will understand the need for compliance of financial reporting with the reporting system for the needs of business management and ensuring control over business. Students will also get to know the role of international organizations and standards that direct financial and non-financial reporting in the international environment.

Teaching methods comprised lectures with presentations, analysis of practical cases, group projects, students' interpretations of case studies and project results, and students' presentations of seminar papers. The students were assessed on a continuous basis, which included their learning and non-learning activities. The assessment of learning results was done through two midterm exams, two seminar papers, and a final exam. Class attendance and activities during the classes also counted towards the final grade.

## **THE IMPACT OF *COVID-19* ON THE TRANSFORMATION OF TEACHING AND LEARNING PROCESSES**

The COVID-19 pandemic period commenced soon after the beginning of the summer semester (the last week in February–the second week of June). As the university already had a well-developed system of e-classrooms for online communication with students based on the Moodle open-source learning platform, it was relatively easy to transform the teaching process into an online learning model. Every professor was responsible for designing teaching methods for the course they were responsible for. This approach increased creativity, imagination, and even agility to attain the best efforts in the pandemic environment. On the other side, students were also very eager to adapt to the pandemic environment. Due to this, their attendance at online lectures significantly increased during a very short period of time.

### ***The change in the teaching process***

The transition from classroom to online learning immediately increased demands for new types of presentation of course material. Extensive PowerPoint presentations were substituted with very short presentations, presenting one notion, additional comments, and very simple tasks that students had to do as their homework. The number of presentations increased with the intention of engaging students in doing various microtasks, commonly given as homework. These presentations were supplemented by mini tests which often included short handwritten explanations, discussions, or comments related to the presentation topic. The aim of these activities was to contribute to remembering and understanding the course topics.

### ***The change in the assessment process***

Consequently, the assessment process had to be adjusted to a new teaching and learning approach. The first step was to additionally break down tests, i.e., midterm exams and seminar papers into mini tests and mini seminar papers, sometimes even micro tests and micro seminar papers. Instead of the official grading of two midterm exams and two seminar papers, a new system introduced the grading of each mini test, mini seminar paper, and a specific microtask. Students were also given more than one opportunity to demonstrate their mastery. If needed, students were able to get extra support from their teacher by mail, phone messages, individual online meetings, and phone calls. As the desired competencies were described in detail, efforts were made to help students track their progress.

## **IMPACTS OF TEACHING AND LEARNING APPROACHES DEVELOPED UNDER PRESSURE ON CURRENT AND FUTURE TEACHING AND LEARNING MODELS**

The immediate impact of the pandemic breakout was the flexibility of the learning process. Students were able to attend classes on a regular basis, but also to review the course material at their own convenience and invest the time in their learning according to their own abilities and capabilities. Subsequently, students attained flexibility to learn at the most convenient time. Students attained more control over their learning process and could revisit lessons whenever it suited them. The consequence of the new approach to the assessment was accepting the various speeds of learning, which is a modification students favourably accepted.

**Figure 1.** The impact of the *COVID-19* pandemic on transition to competency based-learning

<b>Elements</b>	<b>Before the <i>COVID-19</i> breakout</b>	<b>During the <i>COVID-19</i> pandemic</b>	<b>The consequences of the <i>COVID-19</i> pandemic</b>
Teaching material	Defined books and other learning material	In addition to traditional teaching material, new learning material was developed for each topic to divide the topic into mini topics, supplemented by instructions for home work, mini tests and topics for mini seminar papers.	Traditional teaching material is supplemented with detailed instructions for home work, mini tests and topics for mini seminar papers.
Learning place	In the classroom	At home	Hybrid – in the classroom and from home

Flexibility of time	Regular teaching hours	Regular teaching hours combined with the most convenient time for student	Regular teaching hours combined with convenient times for students increase time flexibility.
Speed of learning	All students are expected to move at the same speed.	Students could move at different speeds during the semester.	Students can move at different speeds during the semester.
Assessment strategy	Assessment is a formal process based on two midterm exams, two seminar papers, a final exam, and lecture attendance.	Ongoing process based on mini tests, mini seminar papers, and presentation of completed tasks.	Combination of formal and ongoing processes

Modification of the teaching and learning processes during the COVID-19 pandemic period required more precise definitions of required skills and relevant assessment processes for each lesson, sometimes for different parts of the lesson. The broad approach to the course outcomes (to understand the importance of reporting in accordance with IFRS, to attain the basic knowledge of principles of financial reporting, and to become able to identify appropriate standards for the most common positions in the financial statements) was replaced by the sequence of detailed requirements in the form presented in the following figure:

**Figure 2.** Course: Financial reporting – Example of essential outcomes and required mastery level

Content group/topic	Skill			Representative task
	Remembering and	Application	Analysis	
Selected topics				

	understanding			
IAS 1	yes			Recall the purpose and objectives of financial statements
Components of financial statements	yes			Recall components of financial statements
Balance sheet content		yes		Classify given items within appropriate content elements
Short term vs long term principal of presentation		yes		Classify given items as short term or long term
Comparative information			yes	Compare opening balances with previous year closing balances

### *Ultimate outcome*

The ultimate outcome of the COVID-19 teaching and learning period may be summarized as:

- Improved teaching and learning model for *Clear, Measurable, Meaningful and Integrated Competencies*.
- Awareness of the great number of details necessary to be applied in an online teaching model.
- A more friendly learning environment, incorporating offline and online learning activities.
- Professors gained new expertise in using the Moodle application.
- Knowledge base for developing online programs.

### **CONCLUSION**

The forced implementation of the new approach to the teaching and learning process during the COVID-19 pandemic was an opportunity for professors at the university to rethink the teaching process and relevant assessment strategies. The privilege of direct interaction between students and professors

and verbal discussions during live classroom work had to be replaced with new teaching and learning methods and tools. Drivers for changes were (i) the breakdown of each topic into subtopics; (ii) remodeled teaching material (mini lessons, mini tests, mini seminar papers and detailed instructions for homework); (iii) definition of the required skill for each subtopic; and (iv) the most adequate assessment approach.

The transition to online learning added flexibility to the learning process. Flexibility of learning time contributed to additional homework for students, supporting them in achieving expected competencies.

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C-BEN (n.d.) WHAT IS CBE? Retrieved October 1, 2023 [Competency-Based Education Network \(C-BEN\)](#).

## **WORKERS' WELFARE IN A DIGITAL WORLD: A CASE STUDY OF GOJEK IN INDONESIA**

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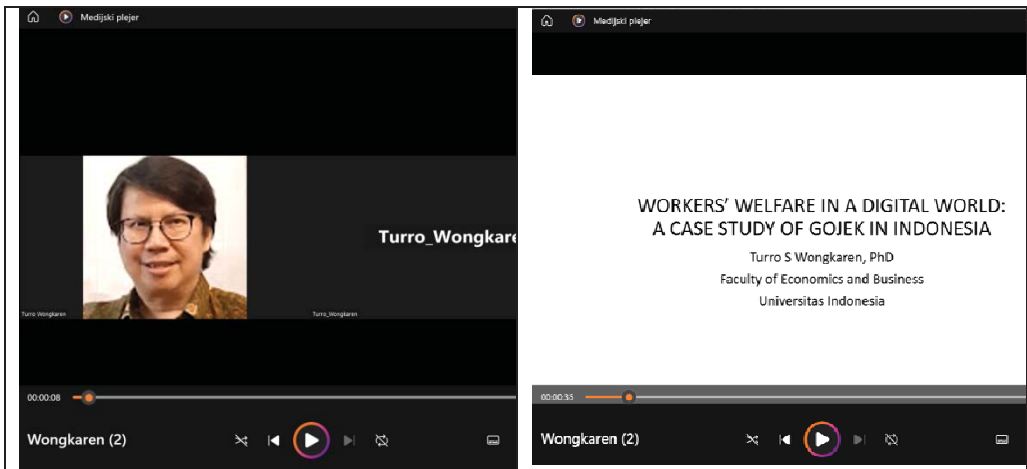
As digital technology permeates many aspects of social life, in this allowing people to order food or send merchandise from their homes, the legal and business models need to adapt to the new reality. Social interactions and industrial relationship changed, making the old models obsolete. It is imperative, then, that the government and the business world understand the way digitalization affects various aspects of life so that regulations and business models can be adjusted accordingly.

This paper discusses GOJEK, an Indonesian technological company that started as a ride-hailing platform but later entered various business ventures. From the beginning, GOJEK has raised a question about the welfare of their drivers. In 2021, GOJEK merged with Tokopedia, the largest marketplace company in the country, and established a holding company called GOTO. Throughout these developments, GOJEK's core business remains in the areas of transportation and logistics: delivering people and goods by motorcycle or car. Many people have argued that being GOJEK drivers has put workers in a disadvantageous position. While at first the drivers earned decent income, especially when the company offered huge promotional discounts to attract customers, overtime their income declined. Another set of policies, such as higher targets per day, made it more difficult for the



drivers to maintain the same levels of income. Despite those difficulties, there are still many people who apply to be a GOJEK driver every day.

The objective of the paper is to investigate GOJEK workers' welfare, in the contexts of different company policy regimes and during the COVID-19 pandemic period. It provides a brief account of the debate surrounding the welfare of GOJEK drivers (the company calls them 'partners'). Then, the paper discusses the conflicting accounts on the issue: several studies found negative impacts of being GOJEK drivers, while some other studies—particularly large survey-based studies, portray a different picture. The last part of the paper discusses several government regulations pertaining to the ride-hailing companies in Indonesia.




Wongkaren (2)

00:00:21

ԻճԵ-ԻՅԻԼԻՆՑ՝ ՕԼԵԿ, ԻՆԴՈՆԵԶԻԱՆ ՄՈԼԴ ԸՈՒ ՄՈՐՈՒՇՎՅԵ ԷՄԻՂԻՅԻ ՄՈԼԴ ՂԵՍ, ՏԱԳ

- The word Go-Jek comes from an combanul sbbjicstion-dazed ԻճԵ-ԻՅԻԼԻՆԳ
- Ա՛ր ԷԷ ԲԵԳԻՆԻՆԻՆԳ՝ Ի՛ր ՎՅԵ ՈՒՂԻ ԱՆ ՏՕՏՕ ԴԵՇՆՈԼՈԳԻ ԿՈՄԲԱՆԻ՝ ԻՄԻՂԻ ԻՆ
- ԸՕԼԵԿ ԷՆ ԻՆԴՈՆԵԶԻԱՆ

ԸՕԼԵԿ





00:00:39

Wongkaren (2)

Medijski player

It developed...

- **GOSEND**
  - Delivery service inside the area. Anything can be delivered the same day, or for extra fee, in 3 hours

GOFOOD  
Food delivery inside the area useful during the pandemic

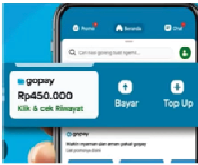
00:00:39

Wongkaren (2)

Medijski player

And to the finance sector ...

- Almost from the beginning, Gojek has developed its own payment system, an e-wallet called GOPAY



**gopay**



00:01:41

Wongkaren (2)

Medijski player

It grows...

- From 2015 to 2023, there have been more than Two Millions driver partners ...

- It has more than Five-hundred Thousands merchant partners

00:01:59

Wongkaren (2)

Medijski player

It contributes to the economy ...

- A study done by Lembaga Demografi Faculty of Economics and Business, Universitas Indonesia found that the whole Gojek system contributed to about USD 7,1 billions to the Indonesian economy...

**One percent**  
of the country's GDP in 2021

00:02:21


Wongkaren (2)

Medijski player

And then ...


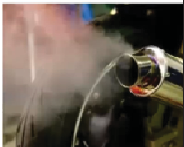

- Another prominent technology company in Indonesia is the market-place TOKOPEDIA, built in 2009.

Tokopedia is the leading marketplace company in Indonesia. In 2021, the number of visits reached 148 millions per month



00:02:41

Wongkaren (2)

<p>They merged ...</p> <ul style="list-style-type: none"> <li>In 2021, the country's two top start-ups merged and formed a new company which served as a holding for the two ...</li> </ul> <p>The new company is called GOTO</p>  <p>00:03:01</p> <p>Wongkaren (2)</p>	<p>In 2022, they went public ...</p> <ul style="list-style-type: none"> <li>GOTO went public in April 2022 with capitalization more than USD 20 billions ...</li> <li>However, since then their values have been declining</li> </ul> <p>00:03:28</p> <p>Wongkaren (2)</p>
<p>Gojek Driver Partners</p> <ul style="list-style-type: none"> <li>Since the very beginning, the status of Gojek driving partners have been in contestation</li> <li>Some stems from the fact that the existing regulations on public transportation did not include motorcycle...</li> <li>As a result, they were not under the road-safety standard for transporting people...</li> </ul>  <p>00:03:43</p> <p>Wongkaren (2)</p>	<p>Partner! Not worker!</p> <ul style="list-style-type: none"> <li>The government later declared that the relationship between Gojek as a company and the drivers is <b>not</b> that of employer and employees, but as a contractor ...</li> </ul>  <p>00:04:03</p> <p>Wongkaren (2)</p>
<p>As a result ...</p> <ul style="list-style-type: none"> <li>Since they are not workers, they are not eligible for the national social protection for employment ...</li> <li>Still, even now there are many people who applied to be Gojek's driver ... WHY?</li> <li>Studies show that the main attraction to be Gojek's driver is the time flexibility.             <ul style="list-style-type: none"> <li>They are free to set their own working time according to their income goal...</li> </ul> </li> </ul> <p>00:04:21</p> <p>Wongkaren (2)</p>	<p>Research is inconclusive ...</p> <ul style="list-style-type: none"> <li>Small-scale, qualitative studies show that the conditions of Gojek drivers are poor because of the flexible time leads to long-hour and poor protection</li> <li>Big-scale, survey type quantitative and qualitative studies show that despite the conditions, they are happy Gojek drivers because of the flexibility and other benefits</li> </ul> <p>00:05:01</p> <p>Wongkaren (2)</p>

The image displays four sequential screenshots from a video player, arranged in a 2x2 grid. Each screenshot shows a slide from a presentation titled "Medijski plejer" (Media Player) with a "Wongkaren (2)" video. The slides are:

- Top-Left:** Slide titled "Multiple Identities". It contains a bulleted list: "It is important to note that Gojek is not the only application-based ride-hailing or delivery company", "There are others such as Grab, Maxim, Air Asia, and so on", and "So, many drivers are partner with several companies, and have those application in their cell-phones. Whichever 'ring', they go." An image of a Gojek driver on a motorcycle is shown to the right.
- Top-Right:** Slide titled "Meanwhile, the government ...". It contains the text "Gojek and similar companies are under the purview of three ministries:" followed by a bulleted list: "Ministry of Communication for the regulation of the application", "Ministry of Transportation for the regulation of the street", and "Ministry of Manpower for regulation of labor".
- Bottom-Left:** Slide titled "Unresolved ...". It contains a bulleted list: "The Ministry of Communication and Information says, 'We do not have the ability to control the use of application!' Partly, because of the multiple identities of the drivers", "The Ministry of Transportation says, 'We cannot control them since technically they are not public transportation!'", and "The Ministry of Manpower 'We cannot do anything the other two ministries do on something!'".
- Bottom-Right:** Slide titled "End Remarks". It contains a bulleted list: "The case of Gojek underlines the tension between the digital 'new way' and the social structure that is already in place" and "Government often cannot up with the impacts of technology in people's lives".

## ARTIFICIAL V. NATURAL INTELLIGENCE: COULD AI KILL THE LEGAL BUSINESS?

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**Abstract:** *Recently, artificial intelligence (AI) has been developing faster than ever. As a result, there is a discussion about the future of the legal business and whether AI will kill it. The legal business will continue to exist, but it will be changing year by year. Online legal services are created and lawyers use them; some programs, ChatGPT and others, were announced as almost a fully-fledged substitute for lawyers. AI can draw up some legal documents, and, as many argue, formulate legal positions to resolve disputes. There are cases where judges recognized the conclusions made by the AI; supporters replacing lawyers with AI cite three reasons: cheaper, faster, easier for people. However, there are controversial arguments and their weight cannot be ignored, as there is nothing to would undoubtedly prove that AI will be better than lawyers, and none of the well-known law firms or prominent lawyers have yet lost their jobs due to AI. There are legal principles that are the basis of all legal systems and they cannot work without lawyers, compared to whom, AI-services do not have free will, a human brain and human logic, and are based only on mathematics. Finally, it would now be unfair to deny the positive experience of using AI in legal practice; however, a negative aspect also exists, which does not allow us to hastily abandon the business schemes which have become familiar to people due to their connection with justice and legitimate expectations. As a result, the legal business cannot avoid using AI, but AI also cannot kill the legal business. In fact, an important part of legal actions will shift from humans to AI, and the sooner we recognize this, the sooner we can prepare for the new reality which will provide a clear competitive advantage for law firms.*

**Keywords:** *Artificial intelligence, legal business, legal activities, positive and negative experience, law firms.*

## INTRODUCTION

The legal business is very attractive to many people, and every year a huge number of former students leave law schools and join the army of lawyers around the world. For instance, the US legal services industry, the largest legal market in the world, has shown stability, with the number of law firms increasing even slightly from 425,130 to 449,630 between 2012 and 2022<sup>2</sup>. The UK legal business is ranked second in the world, and law firms were able to maintain their revenues despite COVID-19 and lockdown. This legal industry generated 32bl British pounds in 2021<sup>3</sup>. The situation is similar in Germany: there are about 165,000 lawyers in 2023, up from 104,000 in 2000<sup>4</sup>. In Russia on average there is one law firm for every 1,600 residents; the legal market doubled in size in the first decade of this century<sup>5</sup>, and now the situation with the legal business demonstrates relative stability, taking into account general economic conditions affecting all Russian companies and entrepreneurs.

Nevertheless, the new technologies market is developing every year and its size does not allow it to be ignored. Recently, many legal e-services have emerged that are used by law firms and lawyers. It is important that some e-services have been created for people, potential law firms' clients, and they, as many announce, will be able to do without lawyers, make a choice between a real person and an online program. Artificial intelligence (AI) is the new reality of the legal business due to the fact that it is often considered as a fully-fledged substitute for lawyers. AI and its expansion into economic spheres is a persistent trend for many areas of our lives, and lawyers are not alone in this process, but there are some distinctive features that characterize legal actions and they have to be taken into account when organizing the implementation of new technologies.

Legal actions have always been associated with humanity, justice and reasonableness, which are based on our thousand-year-old culture and the ability to think about future generations. To find the answer to the eternal

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<sup>2</sup> Number of law firms in the United States from 2012 to 2022. <https://www.statista.com/statistics/822025/us-legal-services-market-law-firms/>

<sup>3</sup> Legal services industry in the UK - statistics & facts. <https://www.statista.com/topics/8517/legal-services-industry-in-the-uk/#topicOverview>

<sup>4</sup> Number of officially recognized lawyers in Germany from 2000 to 2023. <https://www.statista.com/statistics/895028/number-of-lawyers-in-germany/>

<sup>5</sup> Моисеева Екатерина, Скугаревский Дмитрий (2016). Рынок юридических услуг в России: что говорит статистика (Серия «Аналитические обзоры по проблемам правоприменения»). СПб: ИПП ЕУСПБ, с. 3 – 4.

question of why a person must obey laws, we have to answer what trust is. It is no secret that the roots of trust go back to the human past, which is connected to the present and they all construct the future. The human brain is the room where every stage of this complex history has been preserved; algorithms have never been created for such things. AI does not have a history and does not "think" about the future, its world is being the present, based on datasets. As a result, issues of fairness are not suited to AI, and competition between natural and artificial intelligence would be very dangerous in the legal profession, since justice is not only about mathematics. Jurisprudence is a great humanitarian field, but AI is inhuman. Thereby, AI can simply be an assistant to lawyers, but not lead them. However, law firms cannot ignore by new technologies which will provide a clear competitive advantage for them, otherwise there is the risk of leaving the legal business outside the modern economy.

### **AI AND LEGAL SERVICES: PRO ET CONTRA**

Authors describing how AI can be used in legal fields often cited two cases in which judges allowed the predictive coding method to be used for e-disclosure of evidence. The first case<sup>6</sup> is *Moore v. Publicis Groupe* (2012)<sup>6</sup>, and the second one is *Pyrrho Investments Ltd v MWB Property Ltd* (2016)<sup>7</sup>. The logic of this article does not require a detailed presentation of these judgments, and their contents can be easily found because these cases were repeatedly observed by many legal and IT researchers<sup>8</sup>. However, the judges did formulate some general conclusions about why AI can be used to resolve legal disputes, and also demonstrated the advantages and disadvantages of their legal positions. It is important that their sentences are suitable for many legal systems, including the Russian one.

Thereby, they paid attention to the difficulties of using AI in litigation. Firstly, there is a lack of legal regulation due to the absence of AI in judicial legislation. The laws do not note AI as a legal way for disclosure, and they do not answer whether AI determines the set of legal evidence, and then formulates the legal position of the case. Secondly, in general, many people,

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<sup>6</sup> *Moore v. Publicis Groupe*, 287 F.R.D. 182 (2012)

<sup>7</sup> *Pyrrho Investments Ltd v MWB Property Ltd* [2016] EWHC 256 (Ch)

<sup>8</sup> See, for instance: Christian Gideon (2019) *Predictive Coding: Adopting and Adapting Artificial Intelligence in Civil Litigation*. *The Canadian Bar Review*, 97(3), p. 486 – 525; Matthew G., Kenney, D.B.A. (2016). *The Past, Present, and Future of Predictive Coding*. *Florida A & M University Law Review*, 12(1), p. 165 – 184.

including lawyers, are not inclined to trust AI to resolve human disputes. It is well-known that all new and complex technologies raise mistrust among the majority, and they have to fight for their place and strive for recognition. This process may or may not succeed. However, some technologies may make judgments easier, but at the same time legal constructions that ensure justice may be lost. As a result, such decisions cannot be recognized as fair. Thirdly, there is the possibility of technical problems. Thus, AI can be used, if e-documents are to be evaluated by a judge or other lawyers, but many companies (for example, in Russia) still prefer to keep their archives in paper form. Some documents cannot be clearly recognized by algorithms. It is important that IT-specialists cannot guarantee 100% that there is no error in the programs. And, at least, the mathematical limits within which AI operates cannot be ruled out (why not remember Gödel's theorem<sup>9</sup> and others). Therefore, AI is not suitable for all situations.

However, judges have reported why AI could be applied in legal processes, and many have agreed with them. Firstly, one legal principle was applied that if lawmakers have not prohibited any legal possibility, this one exists and judges have the right to use it. Secondly, technical tools have usually been used in courts for a long time to help court staff do their jobs. For instance, such methods are needed to evaluate the large sets of proofs or complex evidence and obtain useful information. Thirdly, the judgments were based on the logical proposition: like is explored by like (i.e., it would be better if e-evidence were examined using e-tools). Thus, the parties to the lawsuit asked the judge to use AI (predictive coding), the judge agreed with them and allowed this to be done in the case from the UK; in the US case, defendants objected to AI, but the judge insisted on using the program.

Some arguments for AI would be interesting to look at in more detail, and first of all, issues of trust are very important. The judges noted a lack of legal norms, but they applied the analogy of law: someone has already done something similar, so we can do the same. For example, automation and digitalization have been well-known in judicial processes, and AI is just a new stage of digitalization. In addition, AI has been applied widely by executive authorities and there are no negative results. In particular, the positive voice for AI in the government system is supported by some scientific studies and experts. Moreover, the judges have expressed their own views on AI in trials. They were great enthusiasts for new technologies and

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<sup>9</sup> Roger Penrose wrote about this excellently. See: Penrose Roger (1991). *The emperor's new mind*. N.Y.: Penguin Books., 466 p.



were very excited to use predictive coding at the e-disclosure stage. In these cases, trust in AI was a part of the judges' powers, which were independent and discretionary. A judge is the most authoritative lawyer and the most independent in comparison with executive officials. People have to be sure that the court decisions are a measure of justice. The way it works is that if judges start using something, people will be able to believe that it is a good way to solve problems similar to the court decisions.

Finally, the judges articulated three reasons why AI could be useful; AI makes legal services cheaper, faster and easier for people. Thus, in *Pyrho Investments Ltd* the final sample of e-documents after e-disclosure amounted to three million. If the parties had used the traditional method to evaluate them, the job would have required many people. This kind of work would also consume a lot of money and a lot of time. In fact, the use of AI reduced the cost of e-disclosure of evidence from some million pounds to 500,000 British pounds. The economic findings have been proven to make a strong case for replacing lawyers with AI. Actually, the judges tried to be fair and noted that the legal term would allow the parties to reexamine the conclusions generated by AI using traditional methods of working with evidence (without AI), of course, if these parties doubt the quality of the "AI-position". Predictive coding, the judges reported, would be suitable for only similar cases. In all other cases, their specific circumstances need to be examined, and AI may not be as helpful as it might seem. That is, the lawyers still have a chance to survive this verdict.

These cases could set a marker for similar ones around the world, and the judges' arguments are very important for understanding how law firms may develop in the future, as they demonstrate how lawyers can be used AI. The Russian legal system, for example, is no exception, and some findings can be used as evidence of the possibility of applying AI in legal proceedings. In particular, there are no special legal rules regarding AI in the Russian laws on litigation, but authorities, and sometimes companies, use computer programs when they need to obtain information that will help them win lawsuits. It happens that administrative bodies decide on their actions after AI has generated a set of data and "presented" versions of legal positions. At least for now, the practice of investigation crimes using AI is known. Tax authorities announce, among other things, the AI-services and the method of big data to help them collect tax information. In these circumstances, governmental structures gain a new advantage over law firms that lag behind the state in the implementation AI.

At the same time, nothing in Russian laws prohibits the use of AI in litigation. Moreover, legislations contain the definition of written evidence, which can be made in "the form of digital ... records"<sup>10</sup>. As a result, the logical principle "like is explored by like" is the most appropriate, i.e., it would be better if e-documents were assessed using e-tools, and it is clear that AI-services are ranked first among e-tools. To use AI in litigation, parties need to have the AI-service and want to use it, and this does not require a special legal regime. Thus, the Russian giants, like Sber, have already reported about their own AI-programs for analyzing big data. The term "robot lawyer" has been a topic of discussion at many conferences, and law schools, including my university, have tried to teach students how to use AI in their future professions, and sometimes even create "robot lawyers". As a result, it should be recognized that there are technical and legal opportunities for using AI in the Russian legal business, but something remains to be done. Firstly, lawyers have to learn to think in AI terms; secondly, trust in legal AI is also very important and such trust has to penetrate into the brain of lawyers as well as all people.

### **AI V. HUMAN IN COURT: A GREAT MISTAKE OR THE NEED TO BE CAREFUL**

In June of this year, hot news spread around the world. In *R. Mata v. Avianca, Inc* (the US), two lawyers had filed a lawsuit and used the fake case law generated by ChatGPT (a well-known and widely publicized AI-service)<sup>11</sup>. The lawyers, plaintiff's representatives, completely believed ChatGPT and did not verify the information contained in the lawsuit created by AI. These lawyers and their law firm were punished by the judge, who made some statements about the legal and ethical consideration regarding the use of AI in the legal profession. A good lawyer, of course, must have assistants, and use legal reference books and authoritative databases. As a result, it would be good if such a lawyer used new technologies, including AI. A lawyer is like the guardian of justice, and he or she must verify all information before presenting it to the court. Failure to do so may result in harm to the parties due to the false data, as well as harm to others. In particular, in *R. Mata v. Avianca, Inc*. ChatGPT created the false case law,

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<sup>10</sup> Art. 75 (1) the Commercial Procedure Code of the Russian Federation; Art 71 (1) the Civil Procedure Code of the Russian Federation; Art. 70 (1) the Code of Administrative Procedure of the Russian Federation.

<sup>11</sup> *R. Mata v. Avianca, Inc* 1:22-cv-01461. 22.06.2023.

but used the real names of the judges for it. The professional reputation of these judges could certainly be damaged due to the fact that they were credited with doing things they did not do. A competent lawyer must have the abilities to understand whether the certain legal opinions were created by AI or by other lawyers. Otherwise, the professional actions of lawyers are cynical and discredit the entire judicial system as well as the legal profession.

The punishments of these lawyers have been interesting and instructive for the entire legal community. A penalty of 5,000 dollars was imposed and, more importantly, the culprits were required to send the opinion and order on sanctions to their client, Mr. R. Mata, and all judges mentioned in the false case law. It would be right to note that this order was very detailed and contained the description of all their "sins". Thus, readers of this document have the opportunity to learn this cautionary story and formulate conclusions on how AI must be used to obtain correct legal results. Indeed, "the significant publicity", the judge said, of the lawyers' actions is a "specific deterrence" for them and others who decide using AI in their future legal experiments<sup>12</sup>. Reputational costs in such cases are more important than money penalty, since the first of them concerns the entire future professional life. It is right to note that the lawyers have been caught in a web of known misconceptions about the omnipotence of the one AI-service. This completely unacceptable situation would never have arisen if lawyers had been aware of AI and performed their duties properly.

The case of *R. Mata v. Avianca* particularly presents the ethical issues concern to the boundaries of the use of AI. However, there are significant legal characteristics that need to be added to this story. Historically, legal systems have developed in several general ways, and judicial law has always played an important role in this play. In addition, there should be a summary of the principles that are barriers to AI entering the legal actions. The fact is that not a single stage of the judicial process can be carried out without a person, since each stage is created in order for justice to be done. For this, in turn, requires will and the ability to be reasonable, and only humans have them. AI obviously does not have these characteristics; therefore, AI algorithms are better suited to serve as human assistants rather than rulers. Judicial system is an indicator of the official approach, demonstration whether lawyers can be replaced AI, and if so, what powers can be transferred from humans to algorithms. Now, a positive response to AI is

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<sup>12</sup> R. Mata v. Avianca, Inc, par. 32.

impossible in most legal systems. For instance, the Russian legislation contains some provisions that form traditional views on judicial proceedings within the framework of Civil Law countries. There are, among other things, the statements that a judge must guide the own conviction after that this judge has examined the evidence to the fullest extent possibly, and he or she must do so independently<sup>13</sup>. In these circumstances, if the judge is willing to pay attention the capabilities of the AI, he or she must evaluate the conclusions, generated by this program, and it would be best for the judge to understand how such AI works. A judge who places the trust in AI without reasonable verification is failing to perform the duties, which should be considered a violation. Anything else will become possible only after changes in legislation.

## CONCLUSION

Nevertheless, it is clear that AI services allow lawyers to formulate legal views on at least some cases, and there are lawyers who are willing to use AI in their work. Addition, which is very important, nothing in legislation prohibits fundamentally the use of AI in legal actions. However, there are some challenges that hinder the adoption of AI.

AI technology is the new reality, which is not our future, but is already our present. This means lawyers are needed to explain how AI works and what legal areas can be moved from human to algorithms. Now, and it is clear, many law schools are not ready to train such specialists, who would correspond to this reality. As a result, in place of the legal business, at least in many legal systems, other communities and even government bodies are taking the lead and are more actively adopting AI legal services compared to law firms and other representatives of the legal business. This conclusion conceals a more serious and essential legal problem. If lawyers are exempted from the process of adaptation of AI-services into legal actions, AI systems will be created without evaluating the fundamental legal principles that form the basis of many legal systems. As a result, mathematics may take the place where justice currently occupies.

It is well-known that AI-services have changed the current business patterns of law firms. The formula "cheaper-faster-easier" is the main idea that has

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<sup>13</sup> Art. 70 (1) the Commercial Procedure Code of the Russian Federation; Art 67 (1) the Civil Procedure Code of the Russian Federation; Art. 84 (1) the Code of Administrative Procedure of the Russian Federation.

been formulated by researchers, politicians, and even the legal community are well aware of this possibility. As a result, the one side, AI could very likely take over some legal roles that are currently within the legal business and played by humans; the other side, AI could require new legal capabilities to rule technology based on general legal principles. It seems that these changes will affect the junior level of law firms, then the internal structure of law firm will change. And the roles that define law firm work positions can change and possibly become confusing if new opportunities are kept in the hands of juniors and seniors are unable to verify the data that was obtained from them.

Professional ethics is a very important characteristic of a well-run legal business. The new reality requires the formulating of addition ethical models for the use of AI in legal practices. They should be, apparently, created by the set of authors, not just lawyers, and the views of IT specialists, social and technical philosophers, and politicians are very useful in achieving this target. It is also important that new rules must be accepted by society. It would be better to adapt the ethical rules that currently exist to the new reality rather than formulate new ones. In this case, continuity in the development of legal systems can be highlighted. Finally, there is a necessity to determine the framework of the use of AI in legal activities. The result could be called the supreme ethical principle, which has to be created on the basis the of knowledge of certain fields, especially legal, mathematical and IT, and philosophy may be the link between these them.

Despite all of the above, AI cannot kill the legal businesses, which for several centuries have demonstrated stability enviable for many sectors of the economy.

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## IS THE WORLD READY FOR ARTIFICIAL INTELLIGENCE – ADVANTAGES AND IMPACTS

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**Abstract:** *The world is standing at a historical crossroads facing with two main impacts. On one side, business and social environment are under influence of multiple crisis trials from the COVID-19 pandemic, through geopolitical challenges, to economic stagflation and environmental disturbances. On the other hand, the new round of technological revolution and industrial transformation is gaining momentum owing to new technological breakthroughs in artificial intelligence, big data technologies, cryptocurrencies, block chain and other more sophisticated digital technologies.*

*How should humanity navigate such turbulent times is a crucial issue of shared concern for all. This paper gives an attempt to consider the main challenges and benefits that fast development of AI can bring to business, consumers and economy more generally. AI's possibilities and potential impacts differentiate in sectors and regions. Some sectors and regions are set to gain more and some less depending on their economic and digital development level. There is also the pressing concern that it might exacerbate the digital divide by leading to an unequal distribution of opportunities and resources.*

*In the same time AI is a type of technological breakthrough that raises challenges and fears about reaching hypothetical future in which technology becomes uncontrollable. It poses potential risks including job displacement, malicious exploitation and misalignment with human values, and it raises questions about ownership and intellectual property rights, open vs. closed models, the balance between innovation and safety, and more.*

*These uncertainties highlight the urgency to create robust AI governance frameworks to ensure responsible and beneficial outcomes for all. AI governance*

*strategies must evaluate the opportunities and risks and propose ways forward that strike a balance between harnessing AI's potential and safeguarding ethical and economic considerations. The world has to enable that AI development and deployment remains firmly aligned with human-centric principles, driving societal and economic progress at every turn.*

**Key words:** *artificial intelligence, development, digital technology, economic transformation, progress.*

## 1. INTRODUCTION

The modern world faces multiple disruptive situations and crises, from geopolitical turmoil, the war in Ukraine, Israel-Hamas war in Gaza, to accelerated technological transformation, environmental challenges, demographic disturbances, and the energy crisis. The outbreak of COVID-19 has profoundly affected countries' and companies' relationships with digital technologies. Never before has the world's global dependency on digital technology touched all industries from production to trade and all aspects of society – from education to health. Teleworking, distance learning, and e-commerce have surged across the globe, as has the uptake of digital tools in businesses. Governments, businesses, and academia have been quick to grasp the potential of new sophisticated digital technologies like artificial intelligence (AI) to contribute to the crisis response, as well as to fulfill the need for timely, secure, and reliable access to data within nations and across borders (OECD, 2020). In fact, the power of digital technology became so evident, and economies and companies became highly aware that they must now use technology to transform their business models and social patterns.

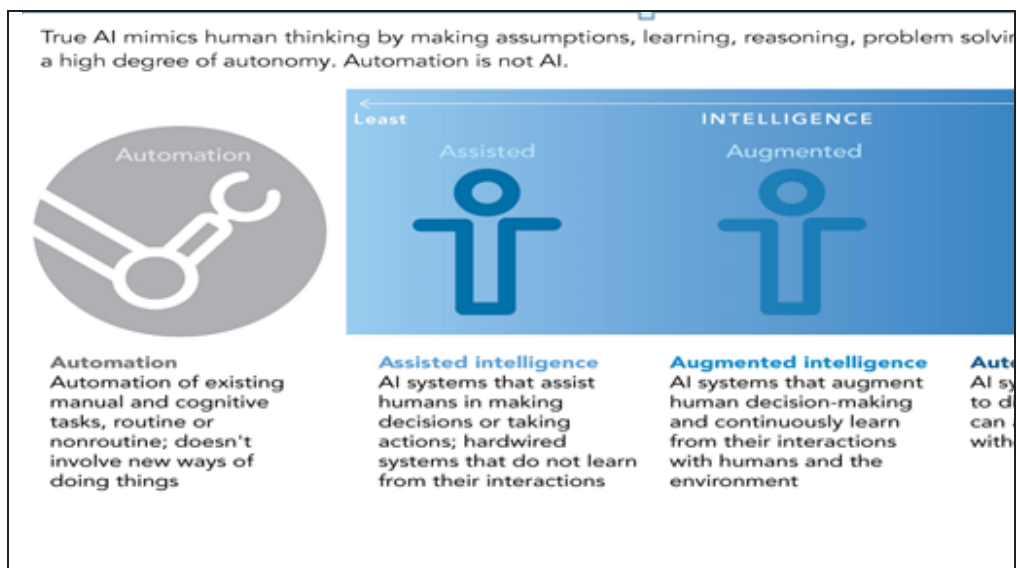
## 2. ARTIFICIAL INTELLIGENCE

Along with other emerging technologies, such as quantum computing, robotics, or blockchain, AI will disrupt life as we know it. It is widely cited that the modern field of artificial intelligence started in 1956 during a summer conference at Dartmouth College sponsored by the Defense Advanced Research Projects Agency. The conference was attended by AI pioneers Marvin Minsky, Oliver Selfridge, and John McCarty, credited with coining the term artificial intelligence. At this conference, Allen Newell, and Herbert A. Simon, presented their groundbreaking Logic Theorist, a computer program capable of proving certain mathematical theorems and referred to as the first AI program (Burns, E., Laskowski, N. and Tucci, L., 2023).



The concepts of AI continue to change in response to new technologies, but the majority of AI experts would agree on this basic definition, defined by The Conference Board: "AI is a technology that mimics human thinking by making assumptions, learning, reasoning, problem-solving, or predicting with a high degree of autonomy" (Burns, E., Laskowski, N. and Tucci, L., 2023). It's more useful to imagine AI as a range, or a spectrum of leading-edge capabilities, with assisted intelligence at one end and autonomous intelligence at the other. Figure 1 shows the levels of development of artificial intelligence, starting from the process of automation that does not belong to the domain of AI to the development of assisted, augmented, and autonomous intelligence.

**Figure 1.** Level of development of artificial intelligence



Source: Rao, A and Verweij, 2017.

## 2.1. Artificial intelligence categories

Categorization of artificial intelligence can be done by distinguishing between weak and strong AI. **Weak AI**, also known as *narrow AI*, is designed and trained to complete a specific task. Industrial robots and virtual personal assistants, such as Apple's Siri, use weak AI. **Strong AI**, also known as *artificial general intelligence (AGI)*, describes programming that can replicate the cognitive abilities of the human brain. When presented with

an unfamiliar task, a strong AI system can use fuzzy logic to apply knowledge from one domain to another and find a solution autonomously (Burns, E., Laskowski, N. and Tucci, L., 2023).

Under today's AI umbrella term, we can include machine learning, deep learning, natural language processing, text analytics, voice recognition, speech recognition, and computer vision. Technological breakthroughs continue to emerge and recent developments, such as in generative AI open up even more potential.

**Generative AI** is a type of AI or category of AI algorithm that generates new outputs based on the data it has been trained on. It can perform tasks that typically require human-like intelligence, such as problem-solving, learning, perception, understanding language, and making decisions. Unlike other forms of AI that are designed to perform specific tasks, generative AI creates new and unique outputs, such as images, texts, music, or even computer code. It has a wide range of applications, including creating content and information that is artificially manufactured rather than generated by real-world events (The Conference Board, 2023).

Most popular generative AI applications are such as ChatGPT, GitHub, Copilot, Stable Diffusion, and others that have captured the imagination of people around the world (Yee, L., Chui, M., Singla, A., Sukharevsky, A. and Hazan, E., 2023). The speed and scale of AI uptake can be illustrated by a simple fact: it took ChatGPT just 60 days to reach its 100 millionth user; in contrast, Instagram took two years to reach the same milestone. ChatGPT was released in November 2022. Four months later, OpenAI released a new large language model, or LLM, called GPT-4, with markedly improved capabilities. The opportunities provided by generative AI are numerous and exciting. For example, it has the potential to revolutionize many creative industries, such as graphic design, writing, and music composition, by automating tasks and freeing up more time for human creativity.

## **2.2. AI implementation dynamics**

According to Statista the global artificial intelligence market size is expected to reach 1, 847, 40 billion USD by 2030, expanding at a CAGR of 37.3% from 2023 to 2030. In 2022 the value of the AI market was \$142 billion and in 2023 it is estimated at 207, 9 billion \$ (Statista, 2023). This growth is driven by the substantial investments made by tech giants in R&D to advance technology. AI patents increased 30-fold between 2015 and 2021 (HAI 2023), highlighting the rapid rate of progress made in AI development. AI-powered technologies can now perform a range of tasks, including

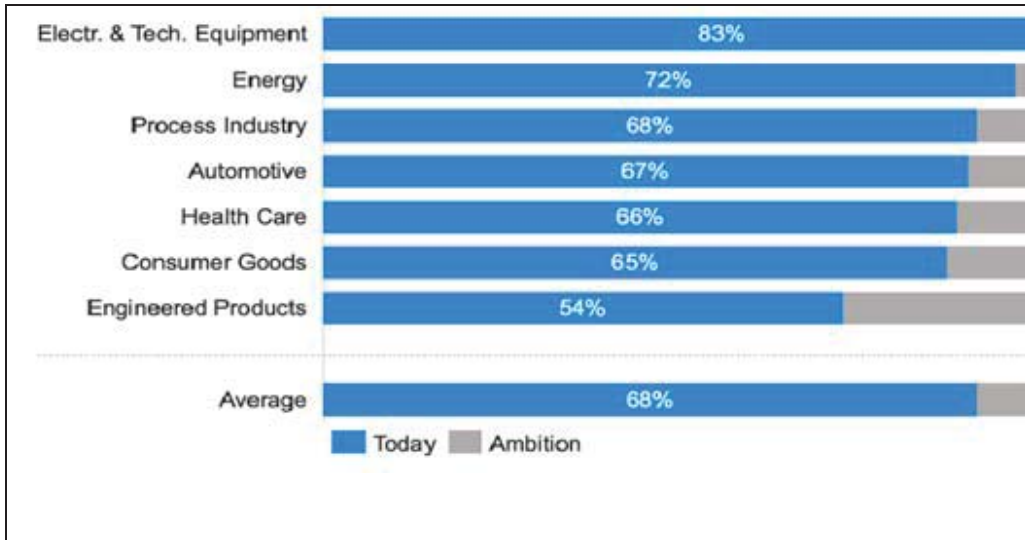
retrieving information, coordinating logistics, providing financial services, translating documents, writing business reports and legal briefs, and even diagnosing diseases. Moreover, they are likely to improve the efficiency and accuracy of these tasks due to their ability to learn and improve via the use of machine learning (Ilzetzki, E., Suryaansh. J., 2023).

When commenting on trends in AI development, a new report by Grand View Research, Inc. (Bloomberg, 2023) points out that the advent of big data is expected to be the cause of artificial intelligence market growth, as a large volume of data is needed to be captured, stored, and analyzed. On the other side, one of the significant concerns restraining AI industry growth is the need for a large amount of data to train AI systems for character and image recognition.

North America has garnered the largest AI market share in 2022 (36, 84%) due to the higher demand for automated and technologically advanced hardware and software products across various industries and the favorable government policies that encourage the adoption of artificial intelligence. The rising investments by various organizations towards the adoption of artificial intelligence enabled Asia Pacific to be the fastest-growing artificial intelligence market with a market share of 29, 33% in 2022. The third big player is Europe having 24, 9% of the AI global market in the same year (Precedence Research, 2023).

AI opportunities are important for all industries and sectors. Companies in some industries have already successfully implemented a variety of AI applications; many others are only at the beginning of their AI journey (Figure 2). Taking a look at different industries, electronics, and technology equipment, with 83% AI adoption, leads the way by a significant margin, followed by energy at 72% and the process industry at 68% (Triantafyllidis, K. and Kuepper, D., 2023).

**Figure 2.** AI implementation in different industries



Source: Triantafyllidis, K. and Kuepper, D., 2023.

### 3. IMPACT ON ECONOMY

In its study of the macroeconomic impact of AI, PWC (2018) indicates that the economic impact of AI will be driven by (a) productivity gains from businesses automating processes as well as augmenting their existing labor force with AI technologies (assisted, autonomous and augmented intelligence) and (b) increased consumer demand resulting from the availability of personalized and/or higher-quality AI-enhanced products and services. Starting with the global GDP of \$75 trillion in 2016 their baseline projections suggest that figure is estimated to be approximately \$114 trillion by 2030. The global GDP could be up to 14% higher in 2030 as a result of AI – the equivalent of up to \$15.7 trillion.

A study published by Analysis Group in 2017 and funded by Facebook differentiates direct effects on GDP growth and indirect effects. The direct impacts of AI on GDP come from increased revenues and employment in firms and sectors that develop or manufacture AI technologies. Secondary, 'indirect' impacts will come from other sectors employing some AI technologies that could make their processes and decisions more efficient as well as increase access to information (PWC, 2018).

The majority of authors believe that AI will increase global economic growth by 4-6% per annum over the upcoming decade (Ilzetzki, E. and Suryaansh, J., 2023). North America and China are likely to be home to 70% of the global economic impact of AI, with other developed countries in Europe and Asia capturing much of the rest (North America is expected to see as much as a 14% GDP boost from AI by the year 2030, while China is expected to see a GDP boost of as much as 26% by that point) (WEF, 2023). Artificial intelligence has the potential to deepen divides both within and between countries, as a result of the distribution of related benefits and know-how. This situation risks spawning both a competitive race between countries for AI dominance and the widening of a knowledge gap that will leave much of the rest of the world even further behind. AI competition entails not only battles over talent and computing infrastructure but also over access to - and control of - data. The ability of data to flow across borders means that early movers in AI can gain global influence that may make it difficult for initiatives elsewhere to catch up.

### **3.1. Impact on productivity and employment**

With the emergence and introduction of general-purpose technology such as the steam engine, electricity, and computers driving rapid growth the world has seen productivity growth of 1.5 to 2 percent per year on average. One of the key questions is could artificial intelligence be the next general-purpose technology to drive productivity? Expectations of WEF are that generative AI could enable labor productivity growth of 0.1 to 0.6% annually through 2040, depending on the rate of technology adoption and redeployment of worker time into other activities, while the Goldman and Sachs study predicts generative AI-based productivity will grow by 1.5% per year (WEF, 2023). According to McKinsey AI technology and other forms of automation will usher in the "next productivity frontier," pushing it as high as 3.3% a year by 2040 (MC Kinsey 2023).

Concerning displacement effect on employment research results mainly indicate a negative impact on employment and wages. Frey and Osborne (2013) estimate that 47% of total US employment is at risk of losing jobs to automation over the next decade (Zahidi, S., 2023). Bowles (2014) uses Frey and Osborne's (2013) framework to estimate that 54% of EU jobs are at risk of computerization. Besides job loss, AI is also expected to have a disruptive effect on the composition of the labor market. The labor market has become polarized over the last few decades towards low-skilled and high-skilled jobs and away from medium-skilled jobs, due to the advent of computers and automatization. Petropoulos and Brekelmans (2020) concluded that unlike

the computer and robotic revolution, the AI revolution is unlikely to cause job polarization as it will affect alter low-skilled, middle-skilled, and high-skilled jobs.

On the other side are authors who believe that AI's productivity and reinstatement effects will be more than enough to compensate for the substitution effect. Some projections state that AI and robotics will have created up to 90 million jobs by 2025, indicating a strong positive labor market impact. According to the World Economic Forum (2023), AI would likely take away 85 million jobs globally by 2025, but at the same time, it would also generate 97 million new jobs in fields ranging from big data and machine learning to information security and digital marketing.

AI systems will result in potentially significant job disruptions, as almost half of an individual's skills - 44% - will need to change on average across all jobs (Zahidi, S., 2023)

There is an urgent need for a rethinking of education, employment, and policy systems. In focus are investment in technology skills but there is also a need for general skills that can improve employment adaptability - such as critical thinking, creativity, human touch, and emotional intelligence. For many companies, there is concern about the talent required to thrive in the new context: 60% of companies are concerned about skills gaps, and 54% worry about being able to attract talent. And for governments, particularly those that underinvested in education and lifelong learning systems thus far, human capital will become the key impediment to navigating the new economic landscape (WEF, 2023).

### **3.2. AI at company level**

In the business sector recent challenges such as supply disruptions, price volatility, talent shortages, and the sustainability imperative, are increasing the complexity of industrial operations. To address these challenges and unlock the next wave of value, leading companies are employing cutting-edge technologies powered by AI (Triantafyllidis, K. and Kuepper, D., 2023). These technologies present industrial companies with fresh avenues to navigate their way through turbulence and offer opportunities to substantially boost their operational performance. The McKinsey Global Institute predicts that around 70% of companies will adopt at least one type of AI technology by 2030, and less than half of large companies may use the full range of AI technologies (Ilzetzki, E. and Suryaansh, J., 2023).

Artificial intelligence has the potential to radically transform business, as it brings numerous benefits, as well as significant changes in business processes. Thanks to the methods and techniques of artificial intelligence, the process is automated which frees up resources and allows employees to focus on more complex and strategically important tasks.

By faster and more precise analysis of huge amounts of data, artificial intelligence can improve the quality of decision-making in business. Also, this amount of analyzed data facilitated by AI technologies will allow firms to improve the quality of products and tailor them to consumers, increasing their value. AI can analyze user behavior to offer personalized products, services, or recommendations, which significantly improves user experience and loyalty. All of these activities are leading to increased consumer demand (PWC, 2018). In addition, AI can help companies increase their operational efficiency by optimizing the supply chain, improving resource planning, and enabling better risk management. Thanks to machine learning, market trends can be analyzed and future changes can be predicted, which allows companies to adapt to changes in the market and thus remain competitive.

Concerning the most often challenges when implementing AI executives in manufacturing companies mention: insufficient organizational foundations, scarcity of digital skills and capabilities, absence of AI strategy and roadmap, technology foundation, inadequate data processing and data visualization infrastructure (Triantafyllidis, K. and Kuepper, D., 2023).

#### **4. AI IMPACT ON SOCIETY**

Almost every sector of the economy and society has been affected by AI - or will be affected soon. It is necessary to consider how we should develop and use this new tool to its maximum positive benefit. We should also consider whether some AI systems create such a high risk of potential misuse that they should not be allowed at all (WEF, 2023a). Important issues needed to be addressed, include (GeeksforGeeks, 2023):

1. **Bias and Discrimination:** AI systems can perpetuate and amplify human biases, leading to discriminatory outcomes.
2. **Job Displacement:** AI may automate jobs, leading to job loss and unemployment.
3. **Lack of Transparency:** AI systems can be difficult to understand and interpret, making it challenging to identify and address bias and errors.

4. Privacy Concerns: AI can collect and process vast amounts of personal data, leading to privacy concerns and the potential for abuse.
5. Security Risks: AI systems can be vulnerable to cyber-attacks, making it important to ensure the security of AI systems.
6. Ethical Considerations: AI raises important ethical questions, such as the acceptable use of autonomous weapons, the right to autonomous decision-making, and the responsibility of AI systems for their actions. AI raises important ethical questions about the use of technology for decision-making, including issues related to autonomy, accountability, and human dignity.

It is necessary to provide resilient AI governance and regulation. Policymakers and stakeholders should collaborate to establish ethical frameworks and regulatory measures specific to AI to anticipate potential risks, guide development, and ensure a globally harmonized understanding of responsible AI practices.

In April 2021, the European Commission proposed the first EU regulatory framework for AI. The European AI Strategy aims at making excellence and trust through concrete rules and actions. It says that AI systems that can be used in different applications are analyzed and classified according to the risk they pose to users (Feingold, S., 2023).

On 16 June 2023, the European Parliament passed the text of the Artificial Intelligence Act. The Act focuses primarily on strengthening rules around data quality, transparency, human oversight, and accountability. It also aims to address ethical questions and implementation challenges in various sectors ranging from healthcare and education to finance and energy. The purpose of this Regulation is to promote the uptake of human-centric and trustworthy artificial intelligence and to ensure a high level of protection of health, safety, fundamental rights, democracy, and the rule of law and the environment from the harmful effects of artificial intelligence systems in the Union (Feingold, S.,2023).

## **5. AI IN THE REPUBLIC OF SERBIA**

In 2020 Serbia adopted the Strategy for the Development of Artificial Intelligence in the Republic of Serbia for the period 2020-2025 to define objectives and measures for the development of artificial intelligence in the national economy and society. The national AI Strategy is in line with the European Artificial Intelligence Initiative (EU, 2018), which sets out the European Commission's artificial intelligence policy. Expectations are that



by implementation of AI-based technology Serbian economy should enable economic growth, improvement of public services, advancement of scientific staff, and development of skills for the jobs of the future.

In March of 2023, Serbia adopted Ethical Guidelines for the Development, Implementation, and Use of Robust and Accountable Artificial Intelligence. These Guidelines make the basement for the Republic of Serbia to develop and implement AI in a safe manner and by internationally recognized ethical principles, to exploit the potential of this technology to improve the quality of life of each individual and the society as a whole.

In line with the goals and measures of the strategy Government of the Republic of Serbia provided the National Platform for Artificial Intelligence, founded The Research and Development Institute for Artificial Intelligence, and initiated work of the Innovation Fund and Science Fund. The AI platform provides users with an easier and faster way to solve AI tasks, thus representing a serious resource to help strengthen the entire AI community in Serbia (Vlada Srbije, 2023).

The Research and Development Institute for Artificial Intelligence of Serbia was formally founded by the Government of the Republic of Serbia in March 2021. The mission of the Institute is to develop the AI ecosystem and the economically significant AI sector (Vlada Srbije, 2021). The Innovation Fund has the goal of enabling links between science, technology, and the economy. The Strategy for the Development of Artificial Intelligence for the period 2020-2025 stipulates that the Innovation Fund annually allocates one million euros to finance projects related to the development and application of artificial intelligence (Vlada Srbije, 2023a). At the same time, the Science Fund of the Republic of Serbia finances 12 projects within the Program for the Development of Projects in the Field of Artificial Intelligence. The main thematic areas of the program are general artificial intelligence, machine learning, natural language processing, planning, understanding of knowledge, computer vision and speech communication, and intelligent systems (Vlada Srbije, 2023b).

Of the existing international indicators of artificial intelligence status, the Artificial Intelligence Readiness Index is the only one providing comparable indicators for a large number of countries in the world. Based on the 2022 Report, Serbia is ranked 59th out of 181 countries (Table 1). The Index measures eleven indicators grouped into four areas: governance, infrastructure and data, skills and education, and public administration and

services (Oxford Insights and the International Development Research Centre, 2022).

**Table 1.** Regional Artificial Intelligence Readiness Review According to Index

Country	Rank 2019 (of 194 countries)	Rank 2022 (of 184 countries)
Slovenija	38	41
Bugarska	47	44
Mađarska	48	42
Rumunija	55	58
Srbija	58	59
Severna Makedonija	61	71
Hrvatska	62	66
Crna Gora	67	76
Albanija	83	82
Bosna i Hercegovina	95	112

*Source:* Oxford Insights and the International Development Research Centre, 2019, 2022.

## 6. CONCLUSION

The demand for artificial intelligence solutions has grown in the past few years, driven by improved data availability, advanced algorithms, and increased processing power. Along with other emerging technologies, such as quantum computing, robotics, or blockchain, AI will disrupt life and work as we know it. In the business sector leading companies are employing cutting-edge technologies powered by AI to address recent challenges such as supply disruptions, price volatility, talent shortages, and the sustainability imperative. These technologies present industrial companies with fresh avenues to navigate their way through turbulence and offer opportunities to substantially boost their operational performance.

AI's possibilities and potential impacts differentiate in sectors and regions. Some sectors and regions are set to gain more and some less depending on their economic and digital development level. There is also the pressing concern that it might exacerbate the digital divide by leading to an unequal distribution of opportunities and resources. As a small country in transition

Republic of Serbia makes significant efforts to define objectives and measures for the development of artificial intelligence in the national economy and society. Expectations are that by implementation of AI-based technology Serbian economy should enable economic growth, improvement of public services, and development of skills for the jobs of the future.

Although the use of AI tools delivers significant value, it is necessary to approach it carefully and avoid its potentially negative, and even dangerous, consequences. AI is a type of technological breakthrough that raises challenges and fears about reaching a hypothetical future in which technology becomes uncontrollable. It poses potential risks including job displacement, malicious exploitation, and misalignment with human values, and it raises questions about ownership and intellectual property rights, open vs. closed models, the balance between innovation and safety, and more. Every society has a mission to reinforce three fundamental actions for responsible and safe AI development and deployment: to prioritize safe systems and technologies, to ensure sustainable applications and transformation aligning AI with long-term societal goals, to provide resilient governance and regulation. On the global level AI governance framework is necessary to ensure responsible and beneficial outcomes for all. AI governance strategies must evaluate the opportunities and risks and propose ways forward that strike a balance between harnessing AI's potential and safeguarding ethical and economic considerations. The world has to ensure that AI development and deployment remain firmly aligned with human-centric principles, driving societal and economic progress at every turn.

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## TWIN TRANSITIONS – DIGITAL AND GREEN TRANSITION

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**Abstract:** *The "twin transitions" have become more current than the "twin deficits." The number one theme of sustainable development today is the double transition – green and digital transition. Discussions and debates about their contribution to the economy, sustainable development, circular economy, the environment, and the social community are already well known. Discussions now dominate about when the results and outcomes of the digital and green transition will be real. Figures in many countries that have seriously addressed these issues show significant economic, societal, and environmental progress. The goal is to analyse how long it takes to put the dice together - to achieve economic benefit and community adaptation with acceptable environmental costs. The experiences of countries that have already begun to realize the values of sustainable development and promote the circular economy have shown that the economic environment must be accompanied by social support - changes in awareness, habits, and approaches of*

*individuals, then education, culture, as well as social networks, and even politics. Also, the legislation should support the economic and social sphere with timely, adequate, and concrete provisions. The transformation of society and sustainable development implies the contribution of all partners - government, companies, finance, and civil society. The faster the pace of adoption of digitization, the stronger the transformation of society. Although the "twin transitions" generally reinforce each other, they also conflict. These conclusions should help to examine the opportunities and pitfalls of the twin transitions - green and digital transitions, to facilitate policymakers to make adequate decisions regarding a sustainable economy.*

**Keywords:** *digitalization, green finance, green-digital solutions.*

## INTRODUCTION

During the 1980s and 1990s, there was an intense debate among economists about "twin deficits," the problem of simultaneous current account deficits and budget deficits. Discussions about causes and consequences are waning, although they still occur even in developed countries, such as Italy and Spain. Today, attention is focused on the "twin transitions" - green and digital transition. They manifest together, simultaneously supporting and hindering each other.

The twin transitions refer to a comprehensive economic and social transformation that combines environmental sustainability (the "green" aspect) and the adoption of digital technologies (the "digital" aspect). It is a dual process of addressing environmental sustainability and embracing digital technology for economic and social progress. The synergistic effect refers to driving economic growth, improving the quality of life, and responding to global environmental challenges. The concept has gained prominence in recent years as countries and organizations seek ways to address environmental issues while harnessing the potential of digital technologies for innovation and economic development.

The success of the twin transition implies the joint action of the government, private, non-governmental, and civil sectors. Their activities must be aligned with the United Nations Sustainable Development Goals and the Paris

Agreement, which are committed to environmental issues and promoting sustainable development through innovation and technology. All this entails significant investments in clean energy, digital infrastructure, research and development, and strategies and policies to ensure a sustainable and prosperous future. That is why these two transitions require proactive integrated management. While the green transition aims to achieve sustainability in the fight against climate change and environmental degradation, the digital transition aims to use digital technologies for the sustainability and progress of business, society, and citizens.

There are many good practice examples of green and digital transition. They are the result of green digital solutions. Digital technologies can play a crucial role in monitoring and optimizing the use of resources, enabling more efficient and sustainable practices. Green economies include smart grid systems that improve the management of renewable energy sources. The development of precision agriculture uses artificial intelligence for sustainable agriculture for irrigation, animal feed, pesticides, and fertilizer. In transport, these are smart transport solutions to reduce emissions and congestion. In the construction sector, digital technology helps spatial planning. The energy sector uses technological solutions for better maintenance of the energy system, recycling, and use of renewable sources. Policies, such as incentives for the adoption of clean technology and the development of green financing mechanisms, support these transitions by encouraging investments in the green and digital sectors. Such an approach can guarantee the construction of a more sustainable and technologically advanced future that balances economic growth and environmental responsibility.

The analysis of this paper is based on a simple concept, which we consider through two hypotheses: H1 - The faster the pace of adoption of digital technologies, the faster the transformation of the economy and society, and H2 - The broader the application of green technology, it is easier to achieve environmental sustainability.

The structure of the work is as follows. After the introduction, the chronology of the incorporation of green and digital values into the system was presented. The next part presents the green-digital context. Then we

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point to the drivers of the green and digital transition. Before the conclusion, the elements of the transformation are presented.

## **INTEGRATION INTO THE SYSTEM**

Creating a system involves three fundamental prerequisites. The first relates to the willingness to accept the transition. Another prerequisite is the preparation and introduction of regulations. The third, perhaps the most important, are finances and resources. The constant for all three prerequisites is time. It is a long-term process of accepting faster digital transformation and broader application of green technologies.

The transition twins are a central part of the EU's political agenda, intending to strengthen the EU's resilience and open strategic autonomy. According to Muench et al. (2022), the EU aims to be sustainable, fair, and competitive. It achieves this by successfully managing the green and digital transition. In this way, it engages in a rapid and inclusive transition towards ecologically sustainable lifestyles and economies. These two "twins" can reinforce each other in many areas, but they are not automatically aligned.

Digital technologies give strong support to the spread of the green transition. Collecting and monitoring real-time information enables clearer system simulation and forecasting. This significantly improves the efficiency of the system. The use of digital technologies enables the optimization of the number of system operations (green cities, green regions), as well as the exchange of economic activities via the Internet. Thus, new levels of interaction within the system arise, and their management becomes a complex process.

In particular, the digital contribution to the environment is already visible today and with a lot of space for improvement in the future. Several key contributions can be singled out: digital passport (data for business models, competitiveness, and resilience), low-power digital technologies, smart cities, digital networking, and high-performance computing.

IGreen and digital manufacturing will likely represent a competitive advantage for businesses in the future. Companies in global supply chains

will rely on green suppliers whose production methods are tracked and verified using digital technologies. On the other hand, these suppliers will introduce green and digital standards to appear in the global market. We can rightly set the premise that the green and digital transition goes beyond the concept of constant returns within the economy. The twin transitions are factors of increasing returns to scale in the economy because the medium and long-term potentials are much higher. They are already taking place and creating new economic opportunities - creating new jobs, creating new professions, encouraging innovation through human capital. The technologically advanced manufacturing function (with human capital and technology) is based, increasingly on artificial intelligence, IoT, block-chain, and supercomputing. It enables companies to achieve greater returns to scale and the economy to achieve economies of scale. However, inevitably the consequences of such a transformation will also have negative effects through numerous economic, social, and environmental challenges aimed at climate change, and as such imply the loss of jobs, people's livelihoods, public expenditures, limiting food and water, etc. Transformations of society and economy with sustainable ecology imply expensive processes which will dramatically affect less developed and poor economies, and whose future generations will suffer the most from climate change (Tavares, 2022). Setting up an adequate environment requires a radically new way of thinking and requires new business models. One of the biggest challenges is getting innovative technological green solutions out of the laboratory and onto the market. Finally, increasing technological innovation implies financial support, which is often lacking in the early and growth stages of innovative start-ups.

The process of green transition began during the 1990s initially through the initiatives of individuals to introduce regulations to protect jobs in new environmental regulations. It was only in the 2000s that the concept of green transition was introduced into the international public debate (COP15). Since then, awareness ("True Transition") of the importance of transition has been continuously raised, gradually followed by regulation. Where regulation exists, the problem arises of delays in its implementation (problems of greater pollution, loss of jobs, financing). The first concrete step towards the

green transition was made at the UN conference in 2009 when it was decided at the meeting to prepare a study in which all the challenges and risks associated with the transition to a green economy would be assessed and used. At the UN conference in Rio de Janeiro (UN, 2012), with the theme of Green economy in the context of sustainable development and poverty eradication, a concept based on a new paradigm of economic growth through ecosystems and poverty reduction was developed. Although compatible with the earlier UN concept of sustainable development, it carried some risks and challenges. Mostly it referred to less developed countries because it is increasingly demanding, and there was also a fear that it would lead to the strengthening of protectionism from developed countries, problematic financial cooperation, and international inequality. From today's perspective, the fear was justified.

The Just Transition, known from before, is also an important concept. It became part of the Paris Agreement (UN, 2015), the ILO document for a just transition to environmentally sustainable economies and societies for all (ILO, 2016), as well as the 2030 Agenda for Sustainable Development (UNGA, 2015). Just Transition took a special place at COP26, held in Glasgow in 2021. Several developed countries signed the Declaration. The idea was to accelerate the development, application, and dissemination of technologies, as well as the adoption of policies, for the transition to sustainable and green energy systems (low-emission, energy-efficient, with subsidies), while harmonizing financial flows towards sustainable development. Also, it was agreed to provide support to developing countries. This entails three key elements that developed economies implemented a decade ago: 1) investment in the development and implementation of green digital solutions, 2) development of methods and tools for measuring the net impact of green digital technologies on the environment, and 3) recommendations and advice within sectoral policies.

The last organized meeting of the UN (United Nations Environment Program - UNEP) and the European Commission (EC), in June 2023 in Brussels, aimed to further strengthen partnership relations in environmental multilateralism, which will solve the planetary environmental crisis. The focus was on the future of the European and global green transition in the

degraded environment of the planet and the crisis of climate change, loss of biodiversity, and pollution. The causes are apostrophized through current economic, social, political, and geopolitical realities. The central topic during the UN General Assembly, held from September 18 to 26, 2023, was the SDG summit. The UN initiative focused on digital public infrastructure with affirmations of continued commitment to the SDGs.

### **GREEN-DIGITAL CONTEXT**

"Green digital solutions" mean combining digital technology with the aim of achieving ecological sustainability and reducing the negative impact on the environment. These solutions use digital tools, data and technologies to support environmentally friendly practices and initiatives. The experiences of developed countries show that these solutions make a strong contribution to sustainable development. The solution *smart cities* use digital tools (sensors, data analytics and IoT), data and devices, the combined use of which leads to waste reduction and optimization of consumption in the city. They achieve energy efficiency by using digital technologies for monitoring and managing *renewable energy sources* (solar panels, wind farms). *Smart agriculture* uses IoT devices and data to optimize agricultural production, enabling precise irrigation, monitoring crop conditions, and reducing the need for pesticides and fertilizers. *The eco-mobility* solution has proven to be very practical for numerous urban problems through the development of electric and autonomous vehicles, as well as vehicle-sharing platforms and ride-sharing applications, with the aim of reducing greenhouse gas emissions and traffic congestion. The efficiency of public administration is the result of *the digital administration* solution, which has accelerated the processes and procedures of administration. *The smart device* solution for home or business use enables the use of smart devices and applications for better energy consumption management, as well as for monitoring and controlling heating, cooling and lighting systems. The increasingly significant solution of *block chain technology* enables widespread use for supply chain tracking, networking of end users, manufacturers and distributors, payment system, certification of ecological products, etc. *A waste management system* is a solution that uses digital tools for better waste management, including

monitoring and optimizing the collection and recycling process. All of these solutions represent a fusion of technology and environmental responsibility, and are used to create a more sustainable future that simultaneously promotes innovation and reduces the negative impact on the environment.

*Green transition.* This aspect focuses on achieving sustainability by reducing the ecological and environmental impact of economic and social flows. It includes strategies and policies aimed at reducing the negative impact of human activities on the environment, mitigating climate change and conserving natural resources. Key elements of the green transition include switching to renewable and clean energy sources, improving energy efficiency, reducing greenhouse gas emissions, promoting sustainable agriculture, and protecting ecosystems and biodiversity. In this sense, governments, businesses and individuals are encouraged to adopt sustainable practices and technologies, such as electric vehicles, renewable energy systems and sustainable urban planning. Specifically, the green transition is based on four key elements: mitigation of climate change (renewable energy sources, reduction of carbon emissions and the adoption of more sustainable transport and production practices), conservation and biodiversity (ecosystem protection and promotion of sustainable land use), resource efficiency (waste reduction, improving the use of resources and promoting circular economy practices) and the environment (enforcing policies and regulations to ensure compliance with environmental standards).

*Digital transition.* This aspect involves the digital technologies use and the information economy to drive economic growth, innovation, and efficiency. At its core is the digital technologies used to drive economic growth, improve efficiency, and improve social well-being. A prerequisite is the adoption of digital tools, platforms, and data-driven solutions in various sectors. Key components of the digital transition include the development of digital infrastructure (e. g. high-speed Internet access), the use of analytics, artificial intelligence, and automation to increase productivity, and the digitization of various industries, such as health, education, and manufacturing. The digital transition can also include the creation of "smart" cities, where data and technology are used to improve quality of life, improve resource management, and optimize transportation and

infrastructure. Specifically, at the core of the digital transition are four key elements: digitization (the adoption of digital tools, technologies, and processes in different sectors), data management (using data analytics, artificial intelligence, and machine learning, and improving operations), connectivity (broadband infrastructure, digital inclusion) and smart cities (creating an urban environment with integrated technology to improve infrastructure and services).

*Green and digital transition.* The number of elements, tools, and data, along with the optimization of processes, improvements in productivity and sustainability, as well as the setting of regulations, and the adoption of strategies and policies indicates a complex transition process. The potential synergy of the two transitions gives the following outcomes: innovation (solutions to environmental challenges, data analysis for process optimization, development of smart networks), efficiency (digitalization of processes leads to resource efficiency, reduction of waste and energy consumption), new business models (development of technologies clean energy and green technology start-ups), and monitoring and reporting (digital tools can monitor and report on the environment in real-time, under environmental regulations).

## **DRIVERS OF GREEN TRANSITION**

From the experience of developed countries, we can conclude that numerous elements and influences drive the green and digital transition. These experiences are different among developed countries and constantly stimulate debate among scientists and researchers.

Amoroso et al. (2022) analysed the acceptance of two transitions and showed that traditional factors still play a crucial role. These are financial resources, which are used for the acquisition of technology, and the absorptive capacity of the company, which shows integration into current production processes. Market factors, such as demand factors, competition, modern and operational infrastructure, and networks, also have a great influence. They also point out that the regulatory framework remains the leading factor at the institutional level, which includes incentives and tax (dis)incentives.

However, an important aspect is the speed of (non)adoption of new technology. This is often a problem, as it comes from the absence and/or lack of awareness of the costs and benefits of adopting new technology. Often insufficient attention is paid to finding financial and technical support, as well as available government incentives. Also, managers of most companies do not have a risk willing, and it is difficult for them to decide to take on new technological and digitally sustainable solutions. Time also plays a crucial role in a world of rapid change. Therefore, a positive attitude towards innovation is important. Early application of new digital and green technology gives a positive outcome toward sustainable economies, new technologies become more accessible, and benefits and relevant management practices grow.

Developed countries have recognized that the green and digital transition greatly contributes to increasing global employment (ILO, 2022). Labour, as a factor of production, became dominant in the production function. But not labour as physical capital, but as human capital (innovations, inventions, technology). Thus, the following were singled out as priority elements of the green and digital transition: (1) people at the centre of innovation, (2) connecting innovation systems, and (3) rapid exchange of information.

The problem partly faced by developed countries is undervalued investments in green tech SMEs and start-ups, due to high investment risk and profit, capital intensity, absence of collateral, and long-term financing. Recommendations that can be cited as crucial, not only for developed countries, are improving access to finance and increasing innovation funding, investment platforms (improving co-investment), and advisory services for the innovative companies' participation in projects.

At the global level, cooperation has been developed with international actors, such as international institutions and organizations such as the European Commission, the United Nations Conference on Climate Change (COP), meetings and initiatives of the Ministerial Forum on Clean Energy (CEM), the International Labour Organization (ILO), International Energy Agency (IEA) They promote both transitions in the context of sustainable development goals. Also, the governments of the countries, through bilateral and multilateral agreements, are jointly committed to the improvement and

preservation of the environment, through the broad application of digitization. At the national level, there is growing awareness of joint action by the Government, civil society, the business world, and citizens to change habits, knowledge, and skills in line with sustainable development based on new technological solutions.

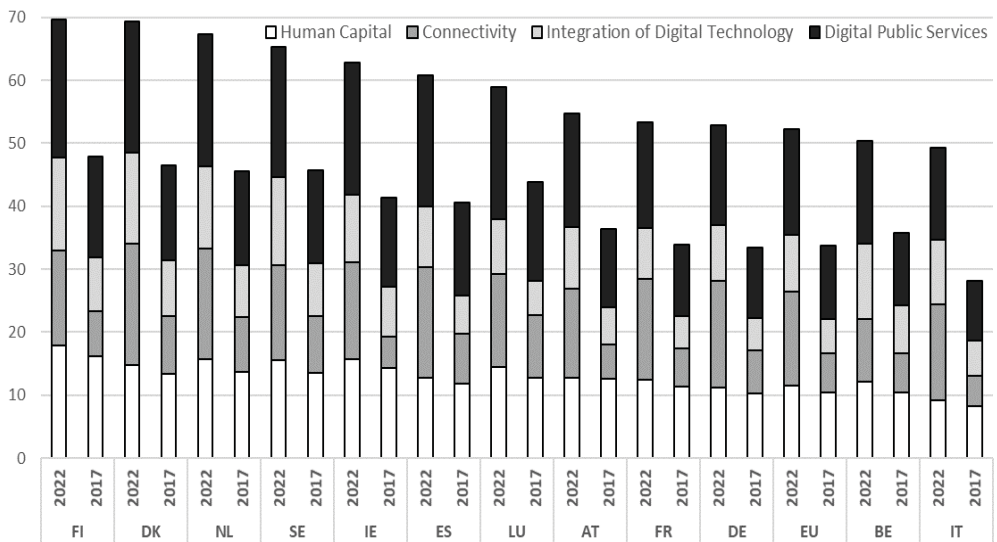
The EU implements programs in the direction of sustainable development and circular economy, through support for digitization (Digital Europe Programme), green energy (The Green Deal), and SDGs (Agenda 2030). The goal is to ensure the supply of clean, affordable, and safe energy, implement the mobilization of the industry for a clean and circular economy, support construction and renovation in energy and resource-efficient way, accelerate the transition to sustainable and smart mobility, and implement the "farm to villa" strategy. In March 2021, 26 EU member states and Norway and Iceland signed a declaration on accelerating the use of green digital technologies for environment benefit. The idea was to apply and invest more in green digital technologies to achieve climate neutrality and accelerate the green and digital transition in priority sectors in Europe (EC, 2021). Companies have also shown social responsibility in this direction. Thus was born the European Green Digital Coalition (EGDC), which consists of 26 companies dedicated to supporting the EU's green and digital transformation, taking action in the following areas (CEU, 2020): 1) investing in the development and application of green digital solutions, 2) developing methods and tools for measuring the net impact of green digital technologies on the environment and climate and 3) joint creation of recommendations and guidelines for the green digital transformation of these sectors that benefits the environment, society and economy.

The European Commission monitors the digital progress of member countries through the Digital Economy and Society Index (DESI). It summarizes the relevant indicators of Europe's digital performance and consists of four elements – human capital, connectivity, integration of digital technology, and digital public services. Figure 1 shows the DESI ranking list (by structure) for developed EU member states in 2017-2022. In the observed period, all EU member states became more digitized. Finland, Denmark, the Netherlands, and Sweden dominate as the most advanced



digital economies in the EU, followed by Ireland and Spain. Germany is slightly above the EU average, while Italy is below. At the back are Romania, Bulgaria and Greece. Developed countries achieve a higher level of digitization than other countries, as well as the EU average, thanks to a high base. Methodologically, the greater the degree of digitization, the greater the adoption of digital technologies by citizens and the economy.

**Figure 1.** DESI for developed EU member states, 2017-2022



*Source:* Authors' calculation according European commission database

During the meeting of the World Economic Forum in Davos in 2022, the Digital Riser Report (ECDC, 2021) was presented, which included an analysis of the digital competitiveness of 140 countries. Within the G7, Canada has the greatest digital success (progress in relative digital competitiveness). Japan and Germany achieved an unfavourable trend in the initial ranking, while Italy achieved a positive trend (from last to second place in 2021). Within the G20, China is the global digital superpower, followed by Saudi Arabia and Brazil. In the last place are India, Japan and Germany. The US has had an unfavourable trend in recent years.

The ranking of green progress by country varies from approach to approach and depends on the coverage of the considered categories. The focus is on how much a country cares about preserving and restoring the natural environment and its resources, as well as the health of its citizens. This is demonstrated through policymaking and the effectiveness of existing measures. Four indicators that can be measured for several countries are shown in Table 1. As a rule, developed countries are ranked best (Costa Rica is an intruder) because they have worked for decades on the quality of their environment and the health of their citizens. Scandinavian countries and Great Britain dominate. At the back are Qatar, Iran, Turkey, China, and Saudi Arabia.

**Table 1.** Most green countries in the world, ranking in 2023

Rank	Countries	The Most Green
1	Sweden	EPI: 5 <sup>th</sup> ; GFI: 9 <sup>th</sup> ; JRC: 28 <sup>th</sup> ; IQAir: 4 <sup>th</sup>
2	Denmark	EPI: 1 <sup>st</sup> ; GFI: 2 <sup>nd</sup> ; JRC: 31 <sup>th</sup> ; IQAir: 16 <sup>th</sup>
3	United Kingdom	EPI: 2 <sup>nd</sup> ; GFI: 4 <sup>th</sup> ; JRC: 34 <sup>th</sup> ; IQAir: 13 <sup>th</sup>
4	Finland	EPI: 3 <sup>rd</sup> ; GFI: 6 <sup>th</sup> ; JRC: 45 <sup>th</sup> ; IQAir: 1 <sup>st</sup>
5	Switzerland	EPI: 9 <sup>th</sup> ; GFI: 14 <sup>th</sup> ; JRC: 27 <sup>th</sup> ; IQAir: 20 <sup>th</sup>
6	France	EPI: 12 <sup>th</sup> ; GFI: 7 <sup>th</sup> ; JRC: 29 <sup>th</sup> ; IQAir: 23 <sup>th</sup>
7	Costa Rica	EPI: 68 <sup>th</sup> ; GFI: 20 <sup>th</sup> ; JRC: 12 <sup>th</sup> ; IQAir: 8 <sup>th</sup>
8	Iceland	EPI: 10 <sup>th</sup> ; GFI: 1 <sup>st</sup> ; JRC: 56 <sup>th</sup> ; IQAir: 3 <sup>rd</sup>
9	Norway	EPI: 20 <sup>th</sup> ; GFI: 5 <sup>th</sup> ; JRC: 49 <sup>th</sup> ; IQAir: 7 <sup>th</sup>
10	Ireland	EPI: 2 <sup>nd</sup> ; GFI: 4 <sup>th</sup> ; JRC: 34 <sup>th</sup> ; IQAir: 13 <sup>th</sup>

Source: GreenMatch (<https://www.greenmatch.co.uk/>)

Note: EPI – the Environmental Performance Index; GFI – Green Future Index; JRC – European Union’s Joint Research Centre; IQAir – Air Quality

However, the success of twin transitions depends on some factors. Economic factors include the costs of adopting both transitions mobility of workers between sectors, skills, and expertise of workers, financing of necessary investments, limited resources, and (mis)alignment between short-term economic assessments and long-term sustainable development goals. Social factors include acceptance/resistance to change, fairness, and changing

behavior and cultural norms, but environmental protection. Technological factors include the digital divide, technological challenges, and cyber security and data privacy. Political factors include regulatory frameworks, standards, and geopolitical aspects. Addressing these factors in developed economies has involved a combination of government policies, public-private partnerships, education and skills development, public awareness campaigns, and innovation. Overcoming these challenges is essential to realizing the full potential of the green and digital transition and achieving a more sustainable and technologically advanced future.

### **TRANSFORMATIONS WITHIN TWIN TRANSITIONS**

The Paris Agreement unequivocally emphasizes the importance of climate technologies for a sustainable future (UN, 2015, Article 10). According to this agreement, innovation is a crucial factor for an effective response to climate change, economic growth, sustainable development, and environmental protection. However, the question arises, as to how to direct investments while simultaneously aiming at both goals - green and digital transition. Digital innovations can reflect the transformation of conventional production and technological processes (smart cities, green energy, sustainable transport, smart houses) so that they are aimed at the goals of green transformation. The reverse rule also applies that green digital technologies encourage digital transformation. In addition, developed countries face the problem of the investment gap in green technology. Why? Investors are not ready to invest in innovative green technologies or start-ups (insufficient level of investment) due to limited commercial profitability. What are the reasons? The reasons are higher investment risk, intensive investment, absence of collateral, and high short-term investment cost. The rule is that investors prefer to invest in safe and mature technologies which are recognizable in the market. Tax policy must be stimulating during the transformation to remove critical restrictions on economic activity.

Herein lies another limitation to rapid transformation. It is not enough to quickly launch innovations from the laboratory to the market. There is also a time lag in the market itself, from the moment of appearance to the moment

of recognition of the innovation. The longer that period is extended, the higher the investment costs. Incentives, through new technological solutions and advice, must be directed towards SMEs and start-ups to improve their business. They are incubators and exploiters of innovations, and they successfully remove bottlenecks in the market. They contribute to the general public good. This is mainly reflected in the opportunity cost of investing in climate technology.

Digital innovations are suitable for blockchain technology applications because such networked systems can provide more successful monitoring, analysis, and control of information, as well as database creation, better calculation, and presentation of results. Collective and business advantages are hidden here (BOX 1), and it's not just having information but sharing, creating, and owning it.

*Box 1: Zero defects VS Poka-yoke*

The term zero defect became part of the quality system in the American manufacturing industry during the 1960s. As a performance goal rather than a program, it also took root in the automotive industry in the 1990s. In recent decades, it is only part of the broader and more complex concept of Poka-yoka. The development centre of Toyota, the auto industry from Japan, has developed a method of protecting against errors or minimizing them for easier elimination. The Poka-yoke method (operator-error) in literal translation is protection against errors. In a manufacturing system, the aspiration is to keep error rates low, improve worker safety, and increase company efficiency. Digital instructions, and detailed procedures are widely used as a tool to avoid errors and the need for subsequent corrections. It is similar to other digital networks and tools. The advantages of the new approach are reduction of waste, reduction of time for employee training, greater security of the entire business system, and greater productivity of workers and the company. Such an approach hides the company's mission that errors are better prevented than detected.

## CONCLUSION

The era of digitization is leading the world away from traditional linear solutions. It dominates rapid adaptation in green transition, energy transformation, nature conservation, soil, and reforestation, as well as building community resilience. The world is moving towards transparent carbon markets, an efficient circular economy, smart energy grids, climate-resilient urbanization, and green finance. The trend of these flows is in the hands of developed countries. The pace of implementation shows that there are differences even among developed countries, but all have achieved significant positive results of the green and digital transition.

The experiences of developed countries have shown that the more the economic, social, and environmental benefits of green and digital transition are understood, the more interested parties are willing to actively participate in this process. Only then can achieving twin transitions lead to a sustainable economy.

The green and digital transition faces several limiting factors and challenges that can hinder its progress. The main limiting factors are financing, short-term return on investment, scientific research, and geostrategic turmoil. Financing is a limiting factor as it often requires significant barriers to investment for governments, businesses, and individuals, especially in less developed countries. A modern and fast life requires an equally quick return on investment, which is not an option with green and digital technology. Science also takes time to turn an idea into an innovation. Finally, inconsistent policies and political instability slow the pace of investment ventures and technological change, adversely affect regulation, and slow down transformation.

Based on the above, several recommendations can be singled out for less developed and underdeveloped countries to achieve maximum benefits from the twin transition, namely: (1) close interweaving of green and digital transition, (2) reduction of the innovation gap in green technology, (3) rapid commercialization of innovation solutions, (4) use of innovation in environmental actions, (5) evaluation of public contribution, (6) financing of

innovation and tax policy, (7) adaptation of innovation to socio-economic and cultural context and (8) international cooperation.

Ultimately, the green and digital transition is a response to the complex challenges of the 21st century, aiming to build a more sustainable and technologically advanced future that balances economic growth with environmental responsibility.

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## **VIOLATION OF THE RIGHT TO INFORMATION ABOUT THE ENVIRONMENT AS AN OBSTACLE TO THE DEVELOPMENT OF THE GREEN ECONOMY**

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**Abstract:** *The paper deals with the problem of interruption of the flow of information about the state of the environment caused by the human factor. Withholding data or providing false information about the environment, the authors recognized as a big and serious problem. Lack of information necessary for environmental risk assessment will certainly lead to delayed reaction of authorities and major environmental incidents with unforeseeable consequences. Society's interest in the environment is increasing due to the fact that the degree of pollution of air, water and other crucial sources of life is constantly increasing. The research question that the paper deals with is how much the violation of the right to information, which is marked as a criminal offense against the environment in the legislation of the Republic of Serbia, can affect the development of the green economy and awareness of the importance of a healthy living environment, on the one hand, and the undertaking of timely protective measures to prevent*



*environmental disasters, on the other hand. Through the conducted research, the authors came to the conclusion that this type of careless behavior negatively affects the growth and development of society, damages the image of the rule of law and undermines citizens' trust in institutions. The paper uses scientific database search methods, general scientific statistical and comparative methods, as well as document content analysis methods. The primary goal of the work is to observe the trend and tendency of the development of this phenomenon and propose corrective measures to suppress it through the conducted research on the criminal offense of violation of the right to information about the environment in the territory of the Republic of Serbia, including adult perpetrators of the criminal offense, in the past ten-year period. The secondary goal of the work is the analysis of the state of court practice in the sphere of completed criminal proceedings, the length of those proceedings and the amount and type of criminal sanctions imposed.*

**Keywords:** *environment, information, violation of the right to information.*

## INTRODUCTION

The environment being the locale where all the life processes of living beings occur is of great importance and has immeasurable significance for the normal functioning of individuals and populations, both human and animal. Nowadays, living and working in the information age, having accurate, verified, and timely information is imperative. Therefore, the right to information in all spheres of life, and especially regarding the environment and the state thereof, is of utmost importance. It is the authors' believe that the normal course of life and work for every individual, group, or living being cannot proceed unhindered in hostile conditions; therefore a polluted environment or any environment threatened by external factors is not conducive to the development of healthy lifestyles. Factors that can lead to environmental pollution lurk on all sides, are numerous, and continuously on the rise due to the rapid development of civilization. Though, the selfless sharing of all available information regarding potential and impending risks to the environment and its condition is a necessity.

However, it is worth emphasizing that amid the abundance of information readily available on internet search engines and social media, there is also a lot of half-truths and misinformation, erroneous data that can have a deleterious effect on the state of the nation and cause needless panic. Nevertheless, it is necessary to find the right way to gather information regarding the state of the environment, centralize data on this issue, and place full trust in the qualified authorities in the field. Further, it should be noted that, with the development of the green economy and the positive

experiences of countries in both the immediate and more distant surroundings (Di Fiore et al. 2022), the procedures of the appropriate authorities should be improved, specialized, and technologically developed so that we, as a country aspiring to join the European Union, can contribute to the better implementation of green economic principles throughout the territory of the Republic of Serbia, including both cities and towns, developed and rural areas.

## **1. THE CONCEPT AND SIGNIFICANCE OF THE RIGHT TO INFORMATION REGARDING THE ENVIRONMENT**

All event analyzed in this study have occurred within the last ten years. All conclusions can be obtained only by analyzing accurate and precise information. This is precisely what tells us how powerful information is today. We live in the information age, and those in possession of the right information also wield power. This maxim is well-known in the business world but is also highly applicable in any aspect of life. When viewed in the context of the issues addressed in this work, the right information, when communicated in a timely manner, can contribute to the preservation and protection of the environment and even save myriad lives. This issue should be considered in a broader context because failures to prevent major fires, floods, and other natural disasters owing to the lack of correct and timely information can have drastic consequences.

According to the currently applicable Law on Public Information and Media, "the right to public information includes, in particular, freedom of expression of thoughts, freedom to collect, research, publish, and disseminate ideas, information, and opinions, freedom of printing and distributing (circulating) newspapers and other public publications, freedom of producing and broadcasting radio and television programs, freedom to receive ideas, information, and opinions, as well as freedom to establish legal entities engaged in informing the public." At the time of this work's publication, this Law was in the process of public discussion regarding a draft of a new Law on public information and media, but upon reviewing the proposed draft, the definition of the right to public information had not changed from the older legal resolution from 2016.

The Law on Environmental Protection specifically addresses the right to environmental information. According to the currently valid legal resolution from 2018, it is defined that "environmental information is any information in written, visual, auditory, electronic, or other material form held by a

public authority or kept on behalf of a public authority, concerning the following: the state of environmental factors such as air and the atmosphere, water, soil, land, natural landscapes and areas, including wetland, shoreline, river, and lake areas, biodiversity and its components, geodiversity and geo-heritage, genetically modified organisms, as well as the interaction between these factors; factors such as substances, energy, noise, radiation, or waste, including radioactive waste, emissions, discharges, and other forms of release into the environment that affect or may affect environmental factors; measures (including administrative measures), such as public policies, strategies, legislation, plans, programs, agreements on environmental matters, and activities that affect or may affect the previously mentioned components and factors; reports on the implementation of regulations pertaining to the environment; cost and benefit analyses and economic analyses and assumptions used within the measures and activities previously mentioned; the state of human health and safety, including the endangerment of the food chain, as well as, where relevant, the conditions of human life, immovable cultural goods and their protected environment, and buildings to the extent to which they are affected or may be affected by the state of environmental factors."

The mentioned Law also specifies that any individual can be a requester of environmental information, as well as "information related to endangering or protecting the environment is information about sudden hazards caused by human activity or resulting from natural phenomena, including information about emissions into the environment."

## **2. THE STATE OF THE ENVIRONMENT AS THE FOUNDATION FOR THE HEALTHY DEVELOPMENT OF ITS INHABITANTS**

The environment represents the space in which the survival of living beings is possible, necessary, and essential. Humans, animals, and plants are born, grow, and develop in the space that surrounds them, which we call the environment. The quality of life largely depends on the quality of water, soil, air, and other environmental factors (Danilovic & Lazic, 2018). The relationship between living beings and inanimate matter is mutual, which is why it is crucial to pay attention to physical, biological, chemical, and many other factors that affect them.

In literature, it is often mentioned that the environment is a five-component system composed of the atmosphere, lithosphere, hydrosphere, soil, and

various types of organisms. Any component that is endangered can lead to a disruption of the natural balance and catastrophic living conditions.

Air, water, and soil pollution have been on the rise in recent years due to the increasing human activity, while awareness of the importance of a healthy environment has stagnated or even declined. The desire for greater wealth and economic power has led to the ruthless destruction of the most valuable natural resources. Rivers are drying up in the quest to generate more energy, and are being polluted as people dispose of waste from their property, heedless of where it will end up or what forms it will take. Air is polluted through large industrial chimneys, with little regard for those that will be breathing it, rather focusing on the final product and its produced quantity. Such behaviors have led to nature itself starting to rebel. Major floods, earthquakes, frequent volcanic eruptions, fires - all these are signs that the natural environment is in a very precarious state.

The importance of a healthy environment for the normal functioning of human lives has been recognized since ancient times, and the significant scale of its pollution has been identified as a pressing issue. Awareness of the harm that human activities inflict on the environment is slowly rising, mainly because the environment has started to give back to humans "in kind." The "other face" of the environment, one that is not favorable to humans, manifested through increasingly frequent attacks by nature on humanity and their belongings, has resulted in a series of activities aimed at preserving the environment. So, humans have finally realized that nature can be a good servant but also a harsh master (Lazic et al. 2021).

The fact that the significance of a healthy environment is crucial, and that any cause of pollution needs to be eliminated as soon as possible, is evident from the involvement of most organizations, as well as governments, and ministries in environmental protection actions and the suppression of polluters. Directives, regulations, laws, and provisions are increasingly being enacted to reduce pollutant in our environment. People are encouraged to reduce or even completely eliminate activities that contribute to environmental degradation.

However, it can and should always be - better and more. Directives, regulations, and laws are necessary, but the practices that directly impact the state of the environment are not entirely in line with what is required. People's habits of neglecting nature are deeply rooted, and only strict regulations, coupled with strong incentives and motivational measures, can lead to success. Teaching children from an early age about the importance of

the environment is of utmost importance. Nature should be viewed as something we have inherited from our ancestors and something we should care for and nurture because we, too, need to leave something as an inheritance to our descendants.

Scientific studies in the field of medicine consistently emphasize that human health is at risk due to the pollution of water, air, and soil. Environmental pollution has become a global problem. What the extent of the damage caused by humans to nature, its intensity and scope, is best seen in the fact that nature cannot recover on its own; it requires help from those who brought it to this state. Healthy human functioning is not possible in an unhealthy environment.

It's not just the physical health of a nation that is endangered by environmental pollution (Ammons et al., 2022). The mental state is also questionable. The constant turmoil surrounding us, alongside significant noise pollution, and the lack of green spaces and forests (Danilovic & Lazic, 2020), which act as a primary source of noise absorption, has led to mental illnesses being identified as a prominent factor in the declining quality of people's lives.

### **3. VIOLATION OF THE RIGHT TO ENVIRONMENTAL INFORMATION AS A CRIMINAL OFFENSE**

The Criminal Code of the Republic of Serbia recognizes the environment as an important object of protection. In the section of the Code that deals with environmental protection, the legislator has decided to define, among other criminal offenses (such as environmental pollution, failure to take environmental protection measures, unlawful construction and operation of facilities that pollute the environment, damage to environmental protection objects, environmental damage, destruction, damage, removal abroad and import into Serbia of protected natural assets, introduction of hazardous substances into Serbia, unauthorized processing, disposal, and storage of hazardous materials, unauthorized construction of nuclear facilities, killing and abuse of animals, transmission of infectious diseases in animals and plants, providing veterinary assistance negligently, production of harmful substances for animal treatment, pollution of food and water for animal feeding and watering, deforestation, forest theft, illegal hunting, and illegal fishing), the specific criminal offense.

The legislator has stipulated that "anyone who, contrary to regulations, withholds information or provides false information about the state of the environment and phenomena necessary for assessing environmental hazards and taking measures to protect human life and health, shall be punished with a fine or imprisonment of up to one year."

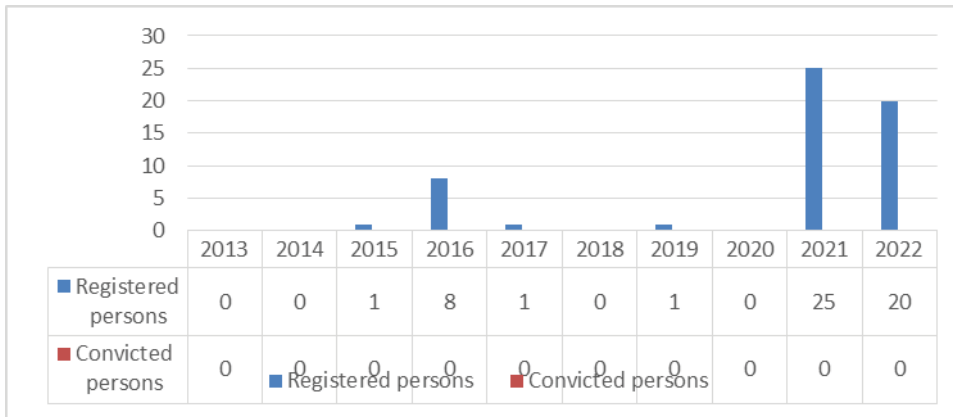
All citizens, or any interested party, have the right to be accurately and promptly informed about the state of the environment; violation of this right results in criminal sanctions. The act of committing this criminal offense involves both actions and inactions. If the perpetration of the criminal offense is active, then false information related to the state of the environment is provided to the interested party. If the perpetration of the criminal is the result of inaction, then the required information about the state of the environment is not provided to the interested party. It should be emphasized that the required information does not have to be strictly related to only the state of the environment but also to assessments of environmental hazards, as well as the timely implementation of measures to protect human life and wellbeing.

Any individual can be the perpetrator of this criminal offense, as long as they have reliable data about the state of the environment. Whether they are an official or an accountable person in this case is irrelevant to the legislator. This criminal offense can only be committed with intent, which includes an awareness that information about the state of the environment has been withheld or false information has been provided.

In certain cases (for the protection of defense and national security interests), the right to be informed about the state of the environment may be restricted by the government, in which case these actions will not constitute criminal offenses.

For the purposes of this study, we analyzed the number of reported and convicted adult individuals for the criminal offense of violating the right to be informed about the state of the environment on the entire territory of the Republic of Serbia over the past ten-year period (2013-2022) in order to assess the frequency of these violations. The data were extracted from the official bulletins of the Statistical Office of the Republic of Serbia.

**Graph 1.** The total number of reported and convicted individuals on the territory of the Republic of Serbia from 2013 to 2022 for the criminal offense of violating the right to environmental information



Source: Author's sketch

Out of the ten-year period under observation, in four years (2013, 2014, 2018, 2020), no individuals were reported or convicted for the mentioned criminal offense. In three years of the ten-year period (2015, 2017, 2019), one adult individual each was reported for this criminal offense, but the proceedings were halted during the investigation phase due to the act not constituting a criminal offense, meaning it lacked all the elements required for it to be considered as such. In 2016, eight individuals were reported, but in all eight cases, it was determined that there were no grounds for suspicion or that criminal prosecution was impractical. What is particularly interesting is that in the last two years of the observed period (2021, 2022), there has been a significant increase in the number of reports. What is especially noteworthy is that over the past ten years, no individuals were convicted for this criminal offense, which provides further reason to continue this research in the coming period to gain a complete understanding of the degree of societal danger. Such data can indicate several scenarios, such as: crimes with these characteristics are not being committed, or they are being committed but are not recognized as such in legal practice, being classified as a different criminal offense, or they are committed as part of a more serious criminal offense, thus making them subsidiary to it.

## CONCLUSION

As evident from human activities as well as nature's responses, it is high time for more drastic measures to be taken regarding environmental protection. In response to human wrongdoing nature reacts even more strongly with behaviors such as climate change, polluted air, contaminated water, or natural disasters like droughts, floods, fires, and such. Forecasts of future natural activity are not optimistic, so it is the last moment for humanity to unite and assist nature to ensure its own existence.

In this work, the authors have made an effort to participate in these activities and contribute with several conclusions and observations.

First and foremost, we believe that timely information about the real state of the environment is crucial. State authorities should direct their activities to provide people with transparent information about the state of the environment and the dangers it poses. In this regard, we should draw from the experiences of other developed neighboring countries that have already introduced notifications to citizens about upcoming weather disasters. Warning systems through mobile phones, messages through media, and notices on road portals warning about expected inclement weather are vital for timely responses from people and the reduction of potential casualties (Peráček, 2019; Savoia, Lin & Gamhewage, 2017, Weinlich et al. 2018). However, great care must be taken in implementing such a of system due to possible and increasingly frequent misuse in this area. Cyberattacks and messages with disturbing content that can be sent to citizens in this manner can lead to general panic and produce the completely opposite effect.

The European Union regulations that the Republic of Serbia has implemented into its legal system are indeed good, but Directives (Directive 2008/99/EC) that pertain to environmental protection focus on water, air, and soil pollution, while noise and vibrations are still largely overlooked. Therefore, noise and vibrations are still treated as minor violations, of an offensive nature, and the authors suggest that limits should be established and criminal liability introduced to some extent in this area.

The criminal offense analyzed in this paper concerns the violation of the right to information, and the judicial practice presented in the paper indicates that this act is not frequent. In fact, over the past ten years, no individuals have been convicted of this offense within the territory of the Republic of Serbia. Criminal proceedings were initiated based on this offense, but would



typically conclude during the investigation or indictment phase. This could lead to the conclusion that this criminal offense is not a social threat, but this should by no means be taken as the conclusion of this paper. Timely information about impending disasters can lead to prompt human responses and save many lives. Therefore, it is highly irresponsible if an individual refuses to share information about upcoming disasters or provides false information. The authors of this paper believe that the punishment prescribed by our Criminal Code is lenient and should be more stringent, precisely because of the potential consequences of such irresponsible behavior.

Furthermore, it's essential to note that this criminal offense should not be considered in isolation, as it can directly lead to the commission of another criminal offense in this area, which is the criminal offense of failing to take measures to protect the environment, as defined in Article 261 of the Criminal Code of the Republic of Serbia. Accordingly, we appeal to experts and the interested public to become more actively involved in eliminating circumstances that aim to destroy, damage, or jeopardize the environment. As the authors, we shall also continue our research in this direction in the coming years.

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## THE STATE AND SCOPE OF THE DIGITAL SECTOR IN THE REPUBLIC OF SERBIA<sup>14</sup>

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**Abstract:** *The digital economy, as a global technological network of economic activities, commercial transactions and professional connections, has a key importance for the development of the entire economy and society. Digitalization has enabled rapid penetration in foreign markets, the development of e-commerce and the internationalization of companies, leading to revolutionary business models and processes. This paper is dedicated to studying the state and scope of the digital economy of Serbia as one of its fastest growing economic sectors. During 2021, investments in the domestic information technology (IT) market had a value of 736 million euros, which represents an annual growth of around 11%, reaching its historical maximum levels. In this way, Serbia recognized the fact that the rise of its educational, innovative, developmental, infrastructural, service and especially export capacity depends on the dynamics of its digital transformation. The*

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*conducted analysis indicates that the domestic Computer programming sector records far higher earnings and growth rates than the national averages, that in the period from 2011 to 2021 the share of its Gross Value Added (GVA) in the country's GDP was in constant rise, as well as that from 2018 to 2022 its total turnover also increased. In this period, there was also an increase in harmful greenhouse gas (GHG) emissions from this sector, as well as in all categories of environmentally taxes paid related to its activities. All these data imply the rise of the digital sector of Serbia, making it an important cornerstone of the development of the national economy. In the future, Serbia should unequivocally encourage investments and stimulate the further growth of this sector in order to catch up with the contemporary world and thus contribute to the modernization of its economy.*

**Key words:** *Computer programming sector, digital economy, environmental taxes, information technologies (IT), Republic of Serbia (RS).*

## INTRODUCTION

The notion of digitalization refers to the use of contemporary digital technologies in business with the aim of changing business models, and thus providing new sources of income and opportunities for generating value added (Gartner Glossary, 2023). Digitalization can also be conceptualized as the adoption of new systems, processes and operations by using computers and the Internet (Oxford Languages, 2023). This process can also be seen as the transformation of analog to digital data that can be further processed, stored and transmitted via computers, digital circuits, equipment and networks. Although many people identify it only with a paperless form of business, digitalization implies much more than that, since it leads to a more inventive, flexible and efficient work styles such as accessing information from mobile devices and holding online remote meetings or teaching classes. In this sense, digitalization represents an essential transformation of the way of doing business, which is achieved by adopting digital technologies to support business processes, as well as by the creation of a completely new value and content for all involved stakeholders in the business chain (Eaton, 2023).

Digitalization, among other things, enabled rapid penetration in foreign markets and internationalization of companies by developing cost-effective business concepts, including electronic commerce (e-commerce). It led to a drastic change in business models and practices that today are based on the use of mobile and Blockchain Technologies, digital and management algorithms, big data technologies, the Internet of Things (IoT), as well as secure techniques for storing and transferring data (cloud computing).

Digitalization has also led to a dramatic reduction in business costs, an increase in the availability of resources and key competencies, the improvement of organizational potentials, as well as to the reduction of the distance and location of business operations problems (Santos Pereira et al., 2022, pp. 1-2). Its importance is all the greater if we take into account the fact that it enables the capturing and dissemination of huge amounts of data, the processing of which through predictive algorithms can help companies to assess the attractiveness and future behaviour of new markets of interest. Neubert (2018, pp. 44-47) reveals that digitalization enables start-up companies to increase the efficiency of business decision-making, as well as to optimize strategies and processes in evaluating all international markets, including their ability to make long-term strategic decisions due to having better market insights. Although predictive algorithms such as artificial intelligence are not able to remove uncertainty, they can still improve the allocation of resources and the prioritization of desired projects, using early warning systems whose valuation is based on their accuracy in predicting future events.

The current circumstances of the extensive development of computer, information and communication technology have enabled the convergence of the digital and real physical world, the development of mobile computing and virtual reality that erase the boundaries between online and offline environments, creating large networks of people, computers and objects. In addition to influencing the speed of the internationalization process, the use of digital technologies has enabled the development of local networks, faster local adaptation of products and services, and better interaction with consumers and clients (Wangeçi Muriu, 2021, p. 7).

On the other hand, the link between digitalization and globalization is reflected in the latter's impact on the reduction of costs of production, sale and advertising of digital products and services, but also in the growth of access to mobile phones and computer equipment, supported by the general trend of reducing their prices. At the same time, the reduced prices of digital equipment and services were made possible by the rapid liberalization of trade and financial flows around the world. However, in addition to digitalization and the information revolution, undeniably other factors have also contributed to the speed and intensity of globalization. They involve the convergence and interaction of a complex of mutually reinforcing technological, political, economic, environmental and social factors (Hart, 2009, pp. 227-228). Among other things, digitalization has erased national borders, as well as many obstacles that have so far prevented start-up, micro,

small and medium enterprises from conquering the global e-commerce market with the aim of connecting them with consumers and suppliers around the world. In this process, the role of contemporary digital platforms, which enable smooth connection of even local producers with global consumers, suppliers, sources of financing and competent human resources, comes to the fore. Thus, start-ups, as well as small and medium-sized enterprises (SMEs), have now a unique opportunity to join global production and supply chains, while at the same time embedding themselves in global social networks and consumer bases (Manyika et al., 2016, pp. 43-45).

Since digitalization today permeates every segment of business, it is also considered the basic trigger of sustainable business and development processes. Mondejar et al. (2021) state that the IoT can represent the basis for sustainable food production, that artificial intelligence can optimize energy production and water resource management, while smart technologies can ensure equitable access to services, the growth of social well-being and the use of green and cleaner energy sources. These authors also highlight that digitalization itself can be useful in dealing with the problems of climate change and global warming. Finally, it is expected that it can contribute to solving numerous issues related to the devastation of biodiversity, desertification and access to clean and safe drinking water. In addition, the very convergence of digitalization and sustainability can provide many advances, from the use of clean technology, all the way to the greening of production and service processes. It offers companies both opportunities and challenges, at the local and global level. New digital technologies enable the development of digital tools and sustainable innovations, as a basic prerequisite for increasing competitiveness in a highly integrated and globalized marketplace (Kiron & Unruh, 2018).

With the Fourth Industrial Revolution (Industry 4.0), digitalization has grown into a major driver of innovations, societal modernization, economic growth, competitiveness, and comprehensive socio-economic progress and development. The Government of the Republic of Serbia (RS) also recognized this fact by prioritizing the digitalization of its electronic administration services with the aim of transforming and increasing the economy, transparency and quality of its public administration (Vlada Republike Srbije, 2023b). The aim of this article is to provide a more detailed insight into the current state, scope and perspectives of the development of the digital sector in Serbia, indicating that there is still enough room for its significant improvements. The next section of the paper is dedicated to the analysis of the most significant indicators of the digital

economy of Serbia, with the highlighted role of SMEs in encouraging the development of the domestic information technology (IT) industry, but also with some indicators that could be better. Its third section reveals and analyses the financial indicators of the national Computer programming, consultancy and related activities sector, while its fourth section is devoted to the study of its environmental indicators. At the very end, the last section concludes the paper.

## **1. THE STATE OF DIGITAL SECTOR IN THE REPUBLIC OF SERBIA**

In 2022, there were about 7.3 million Internet users in Serbia, making up about 84% of its total population. This also represents their growth of 4.5% compared to the previous year of 2021. Although there were 16% non-Internet users at the beginning of 2022, it is estimated that their number is still decreasing. In addition, at the beginning of 2022, there were about 5 million estimated users of social networks, with their participation rate of 57.5% in the total population and an increase of 390,000 (around of 8.5%) compared to the previous year 2021. During 2022, also 8.63 million mobile connections were recorded in Serbia, covering 99.5% of the country's total population and representing a growth of 2.1% compared to the previous year 2021. At the same time, in 2022, 71.4% of the population in Serbia had an account in a financial institution, 17.6% owned a credit card, 59.7% owned a debit card, 19.6% made online purchases and bill payments, while the total value of goods traded on the market of electronic commerce amounted to 733.4 million U.S. dollars. In 2022, 3.69 million people (about 42.51% of the total population) made digital payments, with their total annual value of 1,760 million U.S. dollars (Kemp, 2022).

The intense changes caused by the Digital Revolution put the process of digital transformation at the epicentre of the Serbian economy. Serbia has recognized the fact that the strengthening of its educational, innovation, development, infrastructural, service and especially export capacity depends on the dynamics of its digital transformation. The domestic IT market is experiencing irrepressible growth, with special emphasis on the dynamic of development of new information and communication technologies (ICT), software services and digital innovations, but at the same time suggesting that there are still huge untapped potentials in this area. Experiences indicate that digitized companies are more productive, have better management and know-how solutions, are more flexible, provide better jobs, as well as that

have a greater contribution to the country's economic development. However, despite the financial and regulatory efforts put into the development of Serbia's digital sector, there is still enough room for the growth of investments in digital infrastructure such as the Internet, hardware, software and databases, as well as in the education and development of ICT experts (Madžar, 2022, p. 184). In addition, it is observed that there is no long-term relationship between the Computer programming sector, the use of mobile phones and the workers productivity, pointing to the need for further development of the national digital sector (Madžar, 2023).

In this process, digital innovations play a special role, which represent the basis of the digitalization of the economy and society, as well as the digital transformation of business models and processes. They provide new jobs, more efficient business processes and cheaper and more profitable business opportunities, enabling the ICT sector itself to grow into a kind of unique engine of economic growth (Vidas-Bubanja & Madžar, 2019, pp. 157-162). It is estimated that during 2021, investments in the domestic IT market reached a value of 736 million euros, which represents an annual growth of around 11%, reaching their historical maximum levels. At the same time, Serbia finally surpassed the psychological barrier of 100 euros of investment in the IT sector per capita. The Serbian IT services market reached a value of 300 million euros, which represents a satisfactory annual growth of over 10%. The cornerstone of the domestic IT industry is represented by SMEs, which concerning their income, number of employees, capital and revenue earned make up about two thirds of the domestic IT industry. At the same time, around 70% of them are software development companies (Matijević & Šolaja, 2022, pp. 21-23).

In the last 15 years, the IT sector of Serbia has experienced its dizzying development, from the stage of operations of a few small companies that provided outsourcing services to clients from Western countries, all the way to the stage of a well-developed sector that exports services worth 1.7 billion euros with an exceptional average annual growth rate. Today, the Serbian IT sector is characterized by the operations of globally successful companies that develop complex technological products and operate in large world markets. The number of domestic and foreign IT companies in Serbia that work on developing advanced technological solutions, products and software is also growing. In the period from 2016 to 2020, the export of domestic IT services increased at an average annual rate of 12%. This growth is primarily triggered by the increased volume of business operations, the growth of IT industry value added, the exceptional knowledge of domestic IT engineers,



but also by the inclusion of other experts in the product development chains, such as business analysts, product owners, project managers and test engineers. In addition to the large growth in the number of start-up companies that develop their own IT products, Serbia also has IT companies that have carefully developed their competencies, capacities and strong partnership relations with their global clients, which has resulted in an increase of their volume of work (Popović & Đurđević, 2022).

Today, 95,500 ICT experts are employed in the Serbian IT sector. In 2022, its exports amounted to around 2.70 billion euros, with almost 2 billion euros of realized surplus in the exchange of ICT services. At the same time, the Government of the Republic of Serbia undertook a series of educational measures to increase the number of IT experts. They include improving the environment for digital business, encouraging entrepreneurship through tax and contribution exemptions for digital start-up companies, improving general business conditions by abolishing mandatory paper documentation, digitalizing a large number of public services, providing support for the digital development of a large number of industrial branches, etc. (Vlada Republike Srbije, 2023a). At the same time, Serbia is in the top five countries in the world in terms of the growth of the number of employees in the IT sector, given that in 2021 alone, it had almost 100,000 more registered programmers. For that reason, it is recognized in the world as a country that recruits quality, competent and reliable personnel in its fastest growing IT industry (RTS, 2022).

Despite this, the statistics of digital data in Serbia are still more than modest, which makes it difficult to objectively analyse these issues. The available data on the digital economy of Serbia mainly includes already processed sample data related to the percentage of enterprise users of the Internet, computer networks and cloud services, as well as their participation in e-commerce in the period from 2010 to 2022. At the same time, not all data are available in the observed period, indicating that some of these items are still sporadically examined in national statistics. Below is a tabular presentation of descriptive statistics of the most important indicators taken from the official Statistical Office's published communications on the use of information and communication technologies in the Serbian enterprises, in the time frame from 2010 to 2022.

**Table 1.** Descriptive statistics of some indicators of the digital economy in Serbia

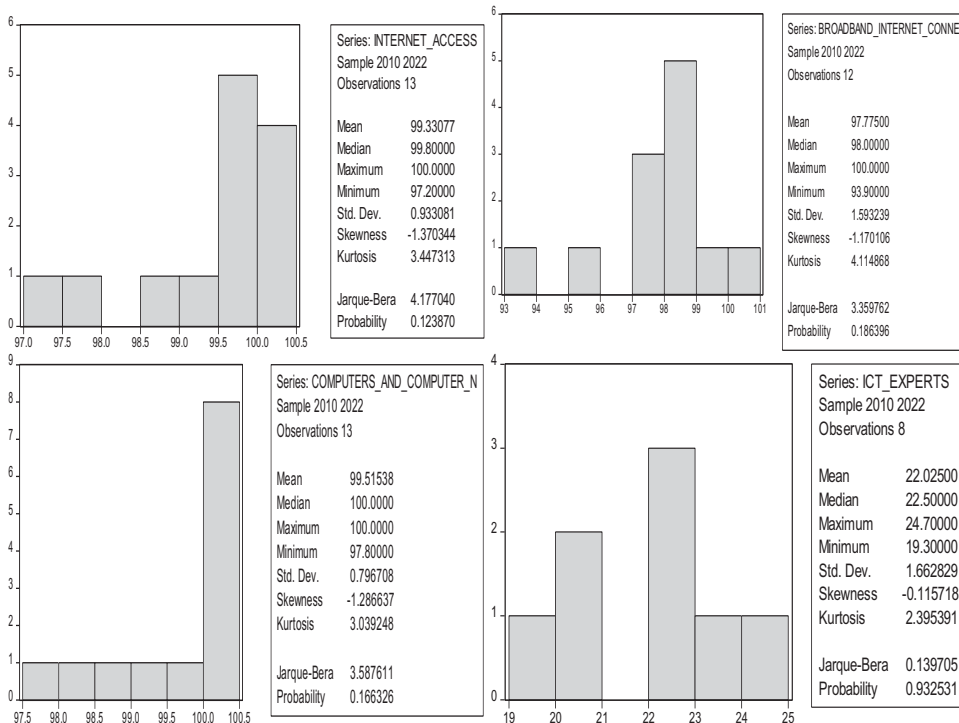
	<b>Internet access (in %)</b>	<b>Broadband Internet connection (in %)</b>	<b>Computer networks (in %)</b>	<b>ICT experts (in %)</b>	<b>Enterprises with a website</b>	<b>E-commerce</b>	<b>Cloud services use</b>
<b>Mean</b>	99.33	97.78	99.52	22.03	77.93	24.19	14.56
<b>Median</b>	99.80	98.00	100	22.50	80.40	23.55	12.40
<b>Maximum</b>	100	100	100	24.70	84.90	28.00	28.90
<b>Minimum</b>	99.20	93.90	97.80	19.30	67.50	20.70	3.80
<b>Standard deviation</b>	0.93	1.59	0.80	1.66	6.29	2.30	8.25
<b>Skewness</b>	-1.37	-1.17	-1.29	-0.12	-0.43	0.09	0.47
<b>Kurtosis</b>	3.45	4.11	3.04	2.40	1.83	1.36	2.16
<b>Jarque-Bera test</b>	4.18	3.36	3.59	0.14	1.15	1.36	0.53
<b>Probability</b>	0.12	0.19	0.17	0.94	0.56	0.51	0.77

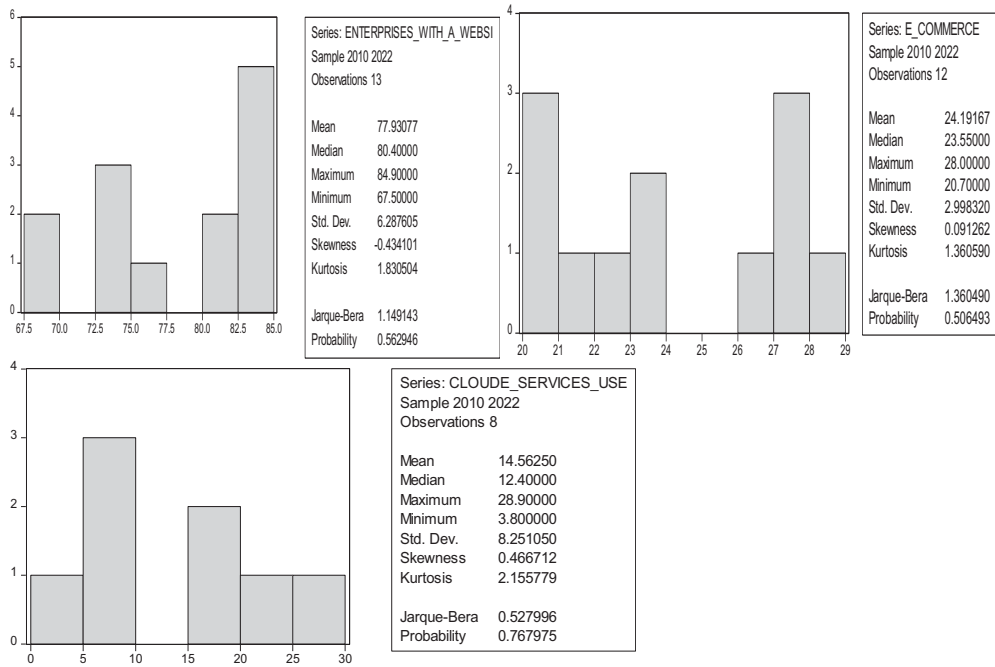
*Source:* authors' calculations

It clearly follows from the Table 1 that in the period from 2010 to 2022, almost 100% of the surveyed companies had access to the Internet, broadband Internet connection and computer networks in their business operations. Moreover, in the period from 2014 to 2021, on average, only 22.03% of surveyed companies employed ICT experts, where their number was relatively stable with a small standard deviation of 1.66%. In addition, in the period from 2010 to 2022, an average of 77.93% of surveyed companies had their own website for the purposes of promoting their products and services, online ordering and monitoring the status of their orders, with their growth of 17.4% in the observed period. Also interesting is the fact that in the period from 2010 to 2021, on average, only 24.19% of surveyed companies were involved in selling and receiving orders via the Internet (e-commerce), with a slight jump in their participation rate of 7.3%. Compared to the European average, this is not such a bad figure since in the countries of the European Union (EU) in 2021, 16.8% of surveyed companies made sales

using only their web (Internet) sites, 3.4% using only EDI technologies, while 2.6% of the surveyed companies used both of these approaches in their sales, totalling 22.8% of the surveyed companies (Eurostat Statistics Explained, 2023). Finally, when it comes to the use of cloud services, in the period from 2014 to 2021, on average, only 14.56% of surveyed companies from Serbia used these services. However, the growth of their share was impressive (a jump of as much as 25.1%), which was probably contributed by the *Covid-19* coronavirus pandemic, recording a high standard deviation of 8.25%. At the same time, all observed variables had a normal distribution, as evidenced by the following Figure 1.

**Figure 1.** Distribution of observed variables



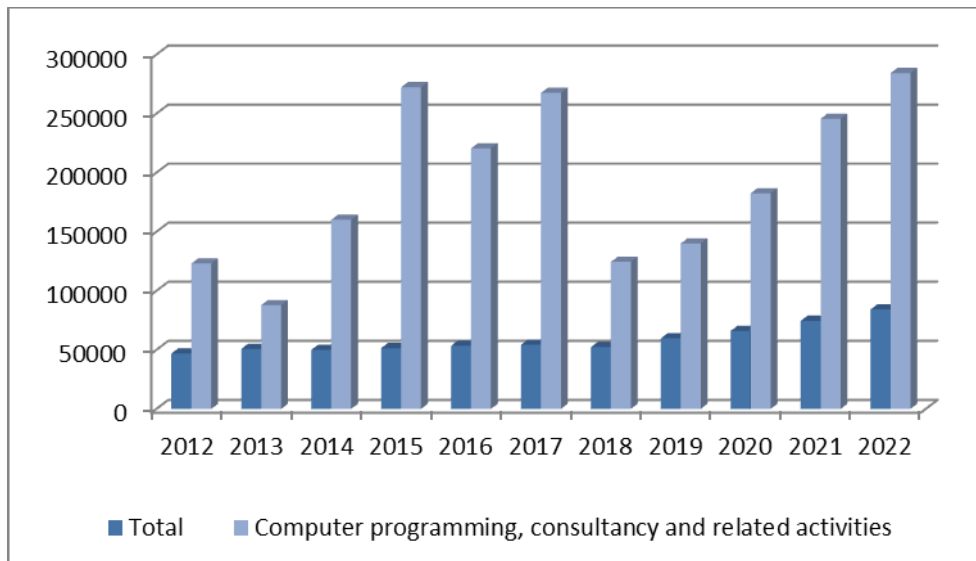


Source: authors' calculations

## 2. FINANCIAL INDICATORS ANALYSIS OF THE COMPUTER SERVICES SECTOR IN THE REPUBLIC OF SERBIA

The Government of the Republic of Serbia, based on the Law on the Classification of Activities (RS Official Gazette, no. 104/09), and the Law on Government (RS Official Gazette, no. 55/05, 71/05 – correction, 101/07 and 65/08), adopted the Decree on the Classification of Activities (RS Official Gazette, no. 54/10). Based on this Decree, the Classification of Activities with their names, codes and descriptions is prescribed. This analysis was applied to activities under the code 62 – Computer programming, consultancy and related activities, which belongs to sector J – Information and communication. The following Figure 2 contains data on the net earnings of this sector.

**Figure 2.** Average monthly net earnings for sector 62 – Computer programming, consultancy and related activities (at the end of the year)



Source: Statistical Office of the Republic of Serbia

As can be clearly seen from Figure 2, the average net salary in the observed economic activities was several times higher than the average net salary at the level of the entire economy. Namely, it was 2.63 times higher in the first year of observation (2012), 3.38 times higher in the last observed year (2022), and even 5.30 times higher in 2015. The average growth rate in the observed sector activities in the period from 2012 to 2022 was 16.6%. Moreover, during 2014 and 2015, extremely high growth rates of the observed economic sector of as much as 82.16% and 70.14% were recorded.

The correlation coefficient that evaluates the linear relationship between the net average salary in the sector under code 62 – Computer programming, consultancy and related activities and the average net salary at the level of the RS entire economy amounted to 0.672230586. This digit indicates the fact that the relationship between the observed variables was positive and moderate (Hinkle, Wiersma & Jurs, 2003), that is, strong (Evans, 1996). During the correlation analysis, the sample included monthly data in the eleven-year period, from December 2012 to December 2022, which was a total of 132 observations for each observed variable.

The information about Computer programming sector Gross value added (GVA), expressed in constant prices in millions of RSD, is shown in Table 2. During 2011, GVA amounted to 28,497.7 million of RSD, while in 2021, this indicator amounted to 139,202.6 million RSD, which is almost 5 times more. The real growth rate was positive in the entire observed period, with

the exception of 2015. The average growth rate of the observed sector in the period from 2011 to 2021 was 11.73%, while the overall average growth rate of the entire economy was a significantly lower and amounted to 2.37% (about 5 times less). Accordingly, there was an increase in the share of the observed sector under code 62 – Computer programming, consultancy and related activities in GDP, which increased from 0.8% in 2011 to 2.3% in 2021.

**Table 2.** Gross Value Added (GVA) for sector 62 – Computer programming, consultancy and related activities

Year	GVA values, constant prices (in mill. RSD)	Share in GDP	Real growth rates
2011	28497,7	0,8%	7,7%
2012	36878,8	1,0%	22,5%
2013	47569,4	1,2%	20,6%
2014	60681,3	1,5%	18,7%
2015	63712,6	1,6%	-0,9%
2016	72702,8	1,7%	8,6%
2017	87923,2	1,9%	14,5%
2018	98013,2	1,9%	6,5%
2019	110410,3	2,0%	13,8%
2020	117295,9	2,3%	5,7%
2021	139202,6	2,3%	11,3%

*Source:* Statistical Office of the Republic of Serbia

Gross domestic expenditures for research and development (GERD) in the observed activities under code 62 – Computer programming, consulting and related activities are shown in the following Table 3. The table shows that the mentioned expenditures were significantly higher in 2020 compared to 2019 and 2021 year, which possibly coincides with the emergence of the *Covid-19* crisis and suddenly changed business conditions. Percentage investments in relation to the entire economy of the Republic of Serbia are not significant and are at the level of several percent, except for 2020 when their share reached 15.20%.

**Table 3.** GERD in sector 62 – Computer programming, consultancy and related activities

Year	Gross investments	Current expenses	Total	Share in total economy
2019	17.418	184.720	202.138	1,06%
2020	130.290	2.825.127	2.955.417	15,20%
2021	27.516	931.835	959.351	3,41%

Source: Statistical Office of the Republic of Serbia

The monthly turnover indices in the economic activity under the code 62 – Computer programming, consultancy and related activities are shown in the following Table 4. What is clearly visible from the mentioned table is that the highest turnover is realized in the month of December and that the monthly index of turnover in the mentioned activity increases constantly, with very few exceptions. The observed growth of the monthly indices is in accordance with the growth of the share of economic activities under code 62 in the total GDP of the Republic of Serbia.

**Table 4.** Indices of total turnover in sector 62 – Computer programming, consultancy and related activities (index, 2015=100)

Month/Year	2018	2019	2020	2021	2022
January	183,0	181,3	221,7	244,0	341,1
February	171,7	167,5	224,9	241,7	355,1
March	213,2	222,2	257,0	315,8	439,2
April	191,8	203,8	235,5	308,6	421,1
May	190,1	207,0	240,2	307,4	437,8
June	238,2	248,4	274,9	398,6	503,2
July	211,7	244,3	263,5	324,4	490,1
August	199,7	234,5	249,9	334,2	502,3
September	233,7	243,3	265,2	334,6	522,1
October	240,0	239,0	294,0	334,8	568,1

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<b>November</b>	212,3	257,6	272,6	389,5	554,3
<b>December</b>	354,0	356,1	398,2	608,9	755,4

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*Source:* Statistical Office of the Republic of Serbia

The data for the total GVA of the mentioned sector activities are in accordance with the average net earnings, as well as with the monthly turnover indices, considering that we can observe a tendency of growth in all indicators. Although GERD, i.e. gross domestic expenditures for research and development are not in constant growth, their share in total expenditures at the level of the entire economy is greater than the share of gross added value in the total Serbian GDP, which certainly contributes to the constant real growth rate of economic activities under code 62 – Computer programming, consultancy and related activities.

### **3. ANALYSIS OF ENVIRONMENTAL PROTECTION INDICATORS OF THE COMPUTER SERVICES SECTOR IN THE REPUBLIC OF SERBIA**

Air pollution emissions of the sector 62 – Computer programming, consultancy and related activities and the sector 63 – Information service activities have been growing in the observed time frame, from 2010 to 2020 (Table 5). The nitrogen oxides emissions have grown 1.75 times since 2010, non-methane volatile organic compounds emissions have increased by 31.06%, sulphur oxides emissions have grown by 14.79%, particulates < 2.5µm have increased by 29.12%, particulates < 10µm have grown by 35.36%, carbon monoxide emissions have increased by 1.19%, while emissions of ammonia have grown 2.3 times since 2010.

In accordance with the observed rising pollution, the environmentally related taxes paid by sector 62 – Computer programming, consultancy and related activities and sector 63 – Information service activities have also been increasing in the observed period. Figure 3 presents all environmentally related taxes paid by sectors 62 – Computer programming, consultancy and related activities and 63 – Information service activities. The energy taxes paid have mostly grown during the covering period from 2011 to 2021. Namely, their average growth rate was 52.35%, while their highest increase was observed in 2016 by more than two times. Energy taxes made the largest share of the environmentally related taxes paid by sectors 62 – Computer programming, consultancy and related activities and 63 – Information service activities. The transport taxes were in their continuous growth during



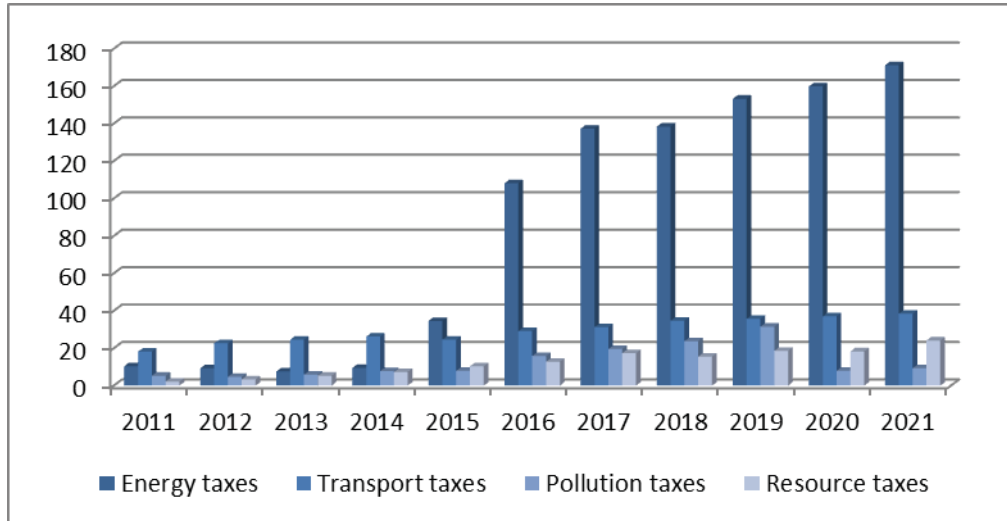
the covering period from 2011 to 2021. Their average growth rate was 8.93%. The highest increase of transport taxes paid was observed in 2019 by 44.83%. At the same time, the pollution taxes were also continuously growing during the covering period from 2011 to 2021. Their average growth rate was even 28.26%. Their highest increase was observed in 2019 by 159.06%. Moreover, the resource taxes were also in their continuous growth during the observed period from 2011 to 2021. Their average growth rate was 28.97%, while the highest increase was observed in 2013 by 59.52%.

**Table 5.** Air pollution emissions of the sector 62 – Computer programming, consultancy and related activities and the sector 63 – Information service activities

Year/Air pollution gases	Nitrogen oxides, t(Mg)	Non-methane volatile organic compounds, t(Mg)	Sulphur oxides, t(Mg)	Particulates 2.5µm, t(Mg)	Particulates 10µm, t(Mg)	Carbon monoxide, t(Mg)	Ammonia, t(Mg)
2010	59,67	12,49	58,08	8,93	9,87	88,99	0,10
2011	73,05	14,97	84,08	12,49	13,79	113,36	0,10
2012	55,21	10,45	43,12	7,12	7,95	67,43	0,09
2013	54,95	9,83	36,25	6,26	7,03	60,40	0,10
2014	57,48	8,82	22,80	4,84	5,53	47,07	0,11
2015	55,55	11,52	38,13	6,70	7,57	64,29	0,14
2016	78,82	13,00	55,64	9,65	11,03	80,89	0,19
2017	96,36	12,96	38,17	8,26	9,70	67,39	0,23
2018	97,08	12,77	32,92	7,56	8,99	60,86	0,23
2019	96,97	13,21	40,98	8,42	9,95	67,26	0,23
2020	104,18	16,37	66,67	11,53	13,36	93,92	0,23

Source: Statistical Office of the Republic of Serbia

**Figure 3.** Environmentally related taxes paid by sector 62 – Computer programming, consultancy and related activities and sector 63 – Information service activities (in mill. RSD)



Source: Statistical Office of the Republic of Serbia

## CONCLUDING REMARKS

In this article, the importance of the digital economy development and the use of contemporary computer technologies for the Serbian economy are pointed out. The digitalization of the Serbian economy has enabled its rapid penetration into foreign markets and the internationalization of its IT sector, especially through the development of computer programming, IT consulting services, e-commerce and more cost-effective business concepts. As is the case in the rest of the world, the digitalization of the Serbian economy has led to a dramatic change in the used technologies, digital and management algorithms, big data technologies, and cloud computing. With the Fourth Industrial Revolution, digitalization has grown into an important driver of innovation, modernization of Serbian society, economic growth, competitiveness and comprehensive socio-economic progress, and thus of development of the country. The RS Government also recognized this fact, by prioritizing the digitalization of its electronic administration services with the aim of transforming and increasing the transparency and quality of its work.

The first part of the article provides an analysis of the digital sector of the Serbian economy, with a detailed presentation of the number of Internet

users, the estimated number of social networks users, the use of mobile phones and credit cards, debit cards and other digital financial services. The intense changes caused by the Digital Revolution put the process of digital transformation at the epicentre of the Serbian economy. The country has recognized the fact that the strengthening of its educational, innovation, development, infrastructural, service and especially export capacity depends on the dynamics of its digital transformation. The domestic IT market is experiencing significant growth, with special emphasis on the dynamic development of new ICTs, software services and digital innovations, but at the same time suggesting that there are still huge untapped potentials in this area, as well as room for improvements. In the last 15 years, the IT sector of Serbia has experienced its dizzying development, from the stage of operations of a few small companies that provided outsourcing services to clients from Western countries, all the way to the stage of a well-developed sector that exports services worth 1.7 billion euros, with an exceptional average annual growth rate. However, despite these facts, the statistics of digital data in Serbia are still modest, which objectively limits the analysis of these important issues. It follows from the analysis that almost 100% of the surveyed companies had access to the Internet, on average only 22.03% of the surveyed companies employed professional ICT experts, on average 80.69% of the companies had their own website for their business purposes, as well as that on average only 14.56% of them used cloud services.

The second part of the paper is devoted to examining the financial indicators of the Computer services sector in the Republic of Serbia, as well as its environmental protection indicators. In the observed period from 2012 to 2022, a much higher net salary was observed in the Computer programming, consultancy and related activities sector compared to the average salary at the level of the Serbian economy, but also a positive and moderate correlation between these indicators. In addition, the share of gross value added (GVA) of this sector in GDP was in constant growth, with the highest recorded growth rates in the period from 2012 to 2014. Its largest share of gross domestic expenditure on research and development (GERD) in GDP was observed in 2020 (15.2%), with a constant growth of monthly turnover indices of this sector. The data for the total gross value added of the mentioned sector activities are aligned with the average net earnings, as well as with the monthly turnover indices, considering that a tendency of growth can be observed in all the analysed indicators.

Finally, the analysis of environmental indicators in this sector showed a continuous growth of air pollution emissions indicators in the period from

2010 to 2020, as well as environmentally related taxes paid in this and the Information services sector, in the period from 2001 to 2021. The trend of all the mentioned indicators unequivocally points to the growing importance of the role of the digital sector in the development of the Serbian economy, giving decision and national policy makers the relevance of these issues. This further means that the digital economy in Serbia should continue to be developed and improved, with a special emphasis on strengthening strategic investments and attracting foreign direct investments (FDI) in this area. Serbia should also insist on connecting the domestic ICT sector with universities, private business, innovation hubs, scientific, research and other relevant organizations in order to use the full potential of this sector in the function of its ultimate economic growth and development.

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## SESSION NO. 2/DRUGA SESIJA

# CUSTOMER EXPERIENCE IN INTELLIGENT ORGANIZATIONS: THE MODERATING ROLE OF DIGITAL TECHNOLOGIES

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**Abstract:** *The aim of this paper is to examine and analyze the current state of intelligent organizations and their usage of digital technologies in building and nurturing customer experience in the digital age. Intelligent organizations use digital technologies with the aim to gather, process and use data from various sources more effectively than other organizations. They are able to monitor the environment, have the capacity to diagnose early market signals and signs and are flexible and agile to proactively prepare themselves for the changes in the customer demands and expectations. Intelligence is considered to be the only thing that can help organizations to survive and succeed in the time of unpredictable, rapid and radical changes. In the digital age, ever-growing competition and extremely high pace of technological developments position customer experience as the factor that should be taken in the process of decision making regarding products and services. The paper provides a valuable summary to understand the current state of intelligent organizations and their usage of digital technologies in building and nurturing customer experience.*

**Keywords:** *customer experience, intelligent organizations, digital technologies, digital age.*



## **INTRODUCTION**

In the digital age, the concept of intelligent organization is of tremendous importance and in the focus of research interest. Intelligence is the only thing that can help organizations to survive and succeed in the time of unpredictable, rapid and radical changes in environment. Knowledge and networking are considered to be among the key factors that impact on organizational competitiveness. At the same time, ever-growing competition and extremely high pace of technological developments position customer experience as the factor that should be taken into account when making decisions about organization - its products, services, processes and goals. Customer experience refers to everything an organization does to deliver superior experience and value to customers, by satisfying their needs and desires. Organizations that use current digital technologies and tools process data to comprehend what is going on in the environment and make decisions on how to respond to those changes (Burton & Obel, 2004).

The aim of this paper is to analyze the current state of intelligent organizations and their usage of digital technologies in building and nurturing customer experience in the digital age. The paper is structured as follows. The first title is dedicated to customer experience in the digital age. The second title is focused on key characteristics of intelligent organizations which operates in the digital age. The third title pointed out the impact of digital technologies on customer experience in intelligent organizations.

### **1. CUSTOMER EXPERIENCE IN THE DIGITAL AGE**

Customer Experience (CX) includes everything an organization does to put its consumers (customers, clients) in the first place, managing their experiences by satisfying their needs and desires. Basically, customer experience refers to everything an organization does to deliver superior experiences and value to customers. In previous decades, the concept of customer experience has received considerable attention in academic circles, as well as in market practice. This concept has been used in literature to describe a wide range of different experiences, including usual and ordinary ones, but at the same time some extreme situations. In this context, the authors Becker and Jaakkola define the consumer experience as an unintentional, spontaneous response and reaction to stimuli (2020). Such a definition is comprehensive, and at the same time separates experience from stimuli, as well as the conscious evaluation that follows from them.

Customer experience can be viewed as a holistic concept, made up of several touchpoints. This implies that during the entire process of satisfying the needs and desires, searching for information, finding alternative solutions in the form of products and services, as well as shopping and consumption experiences, consumers go through various cognitive, affective, emotional, social and sensory elements (McCull-Kennedy et al., 2019). In order for companies to successfully manage the customer experience process, it is necessary to map touchpoints from the point of view of consumers, not the needs of companies and their own goals.

In today's world, where we are witnessing the rapid development of the digital economy, big data analysis, as well as the entire digital environment, have enormous potential in improving the customer experience. First of all, changes are happening in the way companies can see and understand the consumer journey through the shopping experience and making decisions about the best alternative. In addition to quality, companies also gain an advantage in the speed of data analysis in a digital environment, and as well in the ability to react quickly to the expressed needs of consumers. At each touchpoint, consumers show a specific and unique response to environmental influences, which gives a static or discrete customer experience (Holmlund et al., 2020). In recent years, companies have been trying to shift their focus from managing a discrete customer experience to managing the entire customer journey (Holmlund et al., 2020). To be able to achieve this holistic approach, companies must use various data sources for the analysis - not only from their own touchpoints, but also from those owned by partners, consumers, external organizations, whether they are in the digital or physical world, social or business environments.

As already stated, touchpoints are increasingly becoming a focal point in research related to the customer journey through the consumption experience. Despite companies' efforts to effectively manage the customer experience, only a third of initiatives in the customer experience process are successful (De Keyser et al., 2020). Some authors (Bleier et al., 2019) extend the possibility of looking at customer experience not only as cognitive and affective responses of consumers, but also as social and sensory dimensions. At the same time, the online environment poses additional obstacles for customers in their efforts to achieve the maximum level of satisfaction with the purchased product or service through the consumption experience. The first obstacle refers to the degree to which customers can evaluate a product solely on the basis of factual information, without physical contact or tactile experience with the product. Also, uncertainty among consumers can be

caused by doubts about the accuracy and truthfulness of information, as well as trust in the seller's presentation on the Internet. Such dilemmas can be reduced, if not completely removed, by marketing products with a strong brand and image in the minds of consumers. Dimensions by Bleier et al. (2019) presented in connection with the online customer experience concern: informativeness, entertainment, social presence, and sensory component. In order to successfully design their online presence, companies must pay attention to verbal elements. They include written words, linguistic style, level of description, the number of bulleted features, as well as return policy information. In addition to verbal elements, visual elements also play a significant role in the online environment, which includes all content presented in photographs or illustrations, which has a symbolic meaning for the customers and conveys pictorial information (Bleier et al., 2019).

The challenge of setting up a successful online environment for customer experience is also the transition of customers from a situation in which they were interacting with other customers to an environment in which they are in face-to-face sales channels with companies (Weber & Chatzopoluos, 2019). As more and more customers carry digital devices, such as smartphones, there is a need for companies to integrate a unique experience in physical and online sales channels along the touchpoints and the entire customer experience process. Such an interaction of distribution channels would enable a smooth flow of information, products and services through the various dimensions of the consumption experience. Modern technologies that include virtual assistants, chatbots, robots, augmented reality, virtual reality and mixed reality will make the customer's experience in consumption more realistic and simpler even in a purely digital environment. The ability for customers to have fast and accurate information, which includes sensory sensations, not only the written word or image, will significantly accelerate the need for companies to unify the experience across all distribution channels, physical and online. The authors Becker & Jaakkola (2020), in their work, present general guidelines for research in the field of customer experience (Table 1).

**Table 1.** General guidelines for research in customer experience (CX)

Customer experience should be distinguished from stimuli (e.g., the offering) and from evaluative outcomes	Researchers should consider interactions between stimuli within and across levels of the customer journey.
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(e.g., satisfaction).	
The emergence of customer experience can be analyzed at different levels of aggregation: (1) cues, (2) touchpoints, (3) the customer journey, and (4) the consumer journey.	A particular customer experience should not be considered “universally good” or “universally bad” but the dependency of this evaluation on the context should be acknowledged.
Researchers should make choices regarding the types of touchpoints and the level of analysis they investigate and acknowledge the implication that only a part of the phenomenon is addressed.	Studies should account for various contingencies that may influence the effects of offering-related stimuli on customer experience and the effects of customer experience on evaluative outcomes.
Researchers across traditions should adopt consistent labels for types of customer responses.	Timing is relevant for measuring customer experience.
Ordinary and extraordinary customer experiences are a representation of customers’ responses and reactions, and not of the context.	Researchers should adopt a more nuanced definition of customer experience, focusing on intended types and intensity of responses.
Researchers should acknowledge that the focus of customer experience management is stimuli along the customer journey to trigger intended responses.	Stimuli vary in the degree to which firms can control them, requiring different management approaches.

Source: adjusted according to: Becker & Jaakkola, 2020, p. 638.

## 2. THE KEY CHARACTERISTICS OF INTELLIGENT ORGANIZATIONS

By reviewing the literature, it can be found many different views of organizational intelligence. Those views are developed from two basic concepts – learning organization and organization as an information system (Skowron-Grabowska et al., 2019). Organizational intelligence represents the organizational capacity and ability of processing knowledge with the main

aim to provide the best possible solutions for organizational survival and success (Bratianu et al., 2006). An intelligent organization uses the implications of learning for its own development as well as for gaining and maintaining leadership position in the market (Godlewska-Majkowska & Komor, 2019). This concept gained popularity in the 1990s as a result of the rapid development and widespread use of information and communication technologies, a constantly changing environment and business conditions, and increased competition. However, the first steps towards organizational intelligence started in 1967 when Harold published a book „Organizational Intelligence“ and pointed out that organizational intelligence refers on collecting and processing data in order to use them in the process of decision making (Harold, 1967).

In Table 2 are presented some of the different views of intelligent organizations by different authors.

**Table 2.** The view of intelligent organizations by different authors

<b>Authors</b>	<b>View of intelligent organization</b>
Jaworski and Kohli, 1993	Market orientation Intelligence dissemination among various organizational parts
Day, 1994	Integrating exterior knowledge Exporting products and services on the market Product and service innovation
Glynn, 1996	Learning organization Market-driven organization Innovative organization
Waltz, 2003	Business philosophy is based on knowledge management
Schwaninger, 2009	Adaptability to changes Ability to influence and shape the environment Ability to find new market arrangements and to adapt resources Ability to contribute positively to the sustainable development
Skowron-Grabowska et al.,	Entity that is better than others in the process of

2019	obtaining, processing and using information
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Having high proportions of intelligent employees do not imply high organizational intelligence. Each organization that want to become highly intelligent need to have the following characteristics (Bratianu, 2006):

- Ability and readiness to understand and transfer as much as possible employees' tacit knowledge.
- Employees which are willing and ready to commit and engage in double-loop learning activities.
- Capacity to quickly react and adapt to changing and unpredictable environments.
- Organizational structure that is flat, flexible, agile and promote active participation of employees.
- Ability to collect and take care of intellectual capital – knowledge, experience, competence, intelligence, creativity, cultural values and attitudes.

Other authors stated that intelligent organizations are fast, flexible, able to monitor the environment, have the capacity to diagnose early market signals and proactively react to the changes in the environment and have the ability to implement new solutions and achieve significant gains from them (Groesser & Zeier, 2012). An intelligent organization is the one that can gather, process, and use information more effectively than other organizations (Godlewska-Majkowska & Komor, 2019). It focuses on the process of transforming (data into information and knowledge into performance) for organizational advantage, as well as improving innovations and developing and sharing knowledge (Keshavarz et al., 2018).

Intelligent organization gives employees complete freedom of action within their knowledge, skills and experience, eliminating all control mechanisms (Skowron-Grabowska et al., 2019). They are ready to learn day by day and to adapt to the changes in the environment in the most optimal way (Lozano Oviedo, 2019; Beckford, 2020). In that sense, traditional hierarchical structures with strict command and control may inhibit the ability of organization to react on all circumstances and happenings in the environment. In the digital age, the special emphasis must be placed on real-time or near real-time interaction with customers. Intelligent organizations need to be customer-centric and ready to offer products and services personalized to customers (Beckford, 2020).

### **3. HOW INTELLIGENT ORGANIZATIONS USE DIGITAL TECHNOLOGIES TO ACHIEVE EXTRAORDINARY CUSTOMER EXPERIENCE?**

Building and nurturing organizational intelligence is complex activity, especially in the digital age. Each organization is composed of many individuals with different knowledge, skills, experience, backgrounds and roles. In order to build and nurture organizational intelligence, employees need to learn how to work together and how to share their knowledge with the aim to achieve organizational goals and extraordinary customer experience. The important tool in that process is digital technology, which makes it possible to collect data from all sources, process them and visualize in meaningful way.

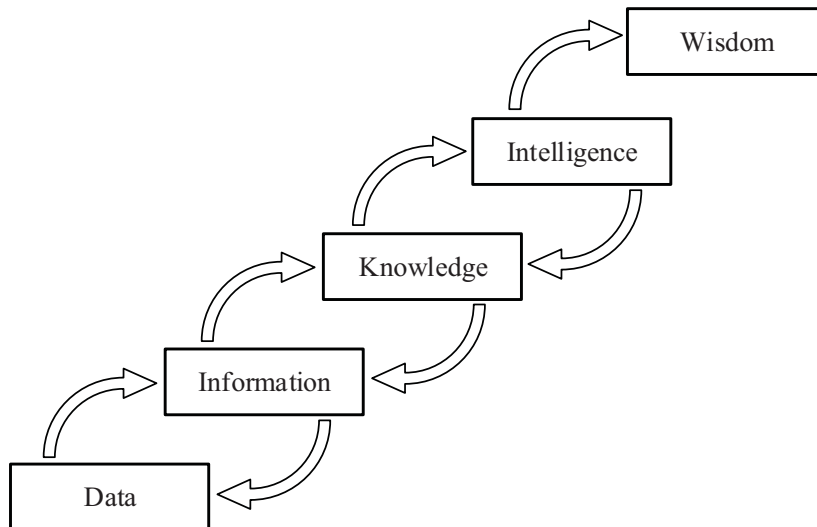
The key dimension by which intelligent organizations function is shaped by the way in which they treat data and information from environment, as well as organizational communication which should be open, transparent and frequent (Lozano Oviedo, 2019). The key questions that should be answered in the process of building extraordinary customer experience are (Beckford, 2020):

- Who are the clients? What are their distinguishing characteristics and expectations?
- What kind of experience do they wish to have?
- What should the processes be?
- What values and behaviors are appropriate?
- How should an organization be managed, adapted, and developed?

In order to answer the above mentioned questions, the key is to better align processes to customer outcomes, and to collect and use all available data regarding customers, their expectations, needs and desires. Organizations that recognize the importance of data and information and manage them properly can significantly enhance their business by better understanding customer demands, adjusting existing and introducing new products and services, saving costs, and avoiding dangers (Hillard, 2010). However, the process of extracting value from data is time-consuming and requires careful consideration. As a result, various scholars in the fields of knowledge management and information systems have focused on data, information, and knowledge (Gajzler, 2016; Liew, 2013). The hierarchy of data-information-knowledge-intelligence-wisdom (known as DIKIW Pyramid) is

used in theory and practice to characterize these ideas, highlighting their differences and reciprocal relationships (Figure 1).

**Figure 1. Pyramid data-information-knowledge-intelligence-wisdom**



Source: adapted from Liew, A. (2013). DIKIW: Data, Information, Knowledge, Intelligence, Wisdom and their Interrelationships. *Business Management Dynamics*, 2(10), 49-62, p. 60.

At the lowest level of the hierarchy are data that can be in the form of various symbols (words, numbers, graphs, images) and signals (light, sound, smell, touch) (Liew, 2013). Regardless of the source from which they come, i.e. whether they are internal or external, data in such raw form has no meaning. Only when they are organized and interpreted in relation to a specific situation, they have the meaning and concrete message. Information strategy should encompass the procedures and rules for recognizing the information required for decisions throughout the organization, recognizing the value of the information, and the right data sources (Beckford, 2020). In order to build the customer experience, it is necessary to take advantage of several options of digital technologies (McKinsey & Company, 2022):

- Apply automating mechanisms to satisfy customer experience;
- Proactive personalization by using customer information to customize products, services, platforms.



- Contextual interaction by using knowledge of where the customer is in the customer journey to deliver them to the next level of interactions.
- Innovations based on data, such as new services, for both the customer and the brand. This includes companies collecting their data and customer insights to understand what other services they might value.

Organizations are progressively focusing on the following segments in order to improve customer experience in the digital age (McKinsey & Company, 2022):

- A user-level „data lake“ containing all customer, financial, and operational data to fully comprehend user experience;
- Predicting customer behavior using analytics that track what influences customer satisfaction and results;
- A mechanism for action and insight shared with a broad set of employees via tools such as customer relationship management platforms.

The key metrics that should be followed regarding customers and their overall experience are: Customer Satisfaction Score, Customer Net Promoter Score, Customer Effort Scores, First Call Resolution Rate, and Churn Rate (Hayes, 2022). Digital technologies make it possible to use data from various sources in real time and to make data-driven decision making.

## CONCLUSION

Digital technology provide several benefits to organizations that conduct their business in the digital age. With their capabilities and capacities, Digital technologies enable organizations to become intelligent in order to respond to consumer needs and provide an exceptional customer experience. Once defined, the customer experience should be constantly reviewed and adapted to the circumstances and real-time needs and desires. A promising value proposition for customers should set the organization on the right path in terms of delivering what is promised to customers. Digital technologies that enable the collection of data from various sources and their processing and analysis represent a significant source of organizational intelligence and competitive advantage in the digital age.

This paper provides a valuable summary to understand the current state of intelligent organizations and their usage of digital technologies in building and nurturing customer experience. It can serve as a reference for scholars and practitioners because it assesses the relationship among digital technologies, organizational intelligence, and customer experience.

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## ENVIRONMENTAL POLLUTION IN THE REPUBLIC OF SERBIA CAUSED BY THE FAILURE OF AUTHORITIES

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**Abstract:** *This paper addresses a prevalent issue in the legal domain, which also concerns the broader society: environmental pollution resulting from various behaviors. Although some of these behaviors are identified as unacceptable and punishable by the Republic of Serbia's legislator, not all have been addressed. The indispensable role of state authorities in this context is underscored. The primary objective of this research is to examine if the eight types of criminal offenses, as defined in the Criminal Code of the Republic of Serbia and directly related to the topic, encompass all illicit actions targeting the environment.*

*Utilizing methods such as scientific database searches, general scientific statistical and comparative methods, and document content analysis, the authors conclude that a swift revision of the procedures of state authorities responsible for the environment is imperative. A secondary objective is to identify the most frequent environmentally harmful behaviors in the Republic of Serbia and recommend countermeasures. The pivotal role in environmental protection is undertaken by*

*state bodies, and it is crucial to evaluate their operations, potential enhancements in procedural implementation concerning illegal construction, and the commissioning of pollutant facilities. This also pertains to the destruction, damage, export, and import of protected natural assets, the introduction of hazardous substances, and illegal handling, disposal, storage, or nuclear facility construction. Addressing these behaviors—through prevention, monitoring, or prohibition—is paramount, highlighting the central role of state authorities.*

**Keywords:** *environmental pollution, state authorities, abuse of authority.*

## INTRODUCTION

Environmental pollution has emerged as a global crisis. Human activities increasingly wreak havoc on nature, jeopardizing its very survival. Calls for action, both nationally and internationally, have grown more frequent, emphasizing the urgency to preserve a healthy environment, promote a green economy, and implement international regulations to address environmental pollution. The unchecked, unauthorized, and negligent human behavior toward our shared environment has resulted in catastrophic consequences, including the contamination of water, air, soil, and food.

Such detrimental human impact on the environment isn't new. Historically, industry often outpaced science. First, industry would market certain products or materials without full knowledge of their potential harm to humans, health, and the environment (Han, 2020). Only later would science catch up to investigate the consequences, leading to the current challenges we face. This widespread recklessness significantly jeopardizes humanity's health. Ironically, humans are the architects of their polluted environment. When nature retaliates and warning signs become too evident to ignore, there is a rushed attempt to remedy the damage and "heal the wounds." More often than not, these efforts are reactive rather than preventive.

Driven by insatiable greed, humans have decimated forests, exploited agricultural lands, and redirected rivers, encasing natural flows within pipes. Natural resources are harvested relentlessly, often with the naive hope that they will last indefinitely and suffice for all, neglecting the fact that nature requires time and conditions to rejuvenate and that prudent management of resources is essential.

Numerous studies confirm that climate change is a direct result of severe pollution, and it represents nature's stern backlash to human carelessness. Recognizing these alarms, nations worldwide have initiated a slew of directives, regulations, agreements, and protocols to protect the environment

and amplify public awareness about this pressing issue. The foreseeable future will undoubtedly be characterized by efforts to resolve both lingering and emerging challenges related to environmental pollution. Thus, prompt and effective responses from governments, relevant authorities, and every individual, as responsible stewards of this planet, are imperative.

## **1. ENVIRONMENTAL PROTECTION IN THE REPUBLIC OF SERBIA AND ENGAGEMENT OF STATE AUTHORITIES**

Criminal law and protection serve dual functions: they guarantee and they protect. They not only ensure the safeguarding of the environment, but also establish boundaries against potential overreach by the state and its authorities. While both minors and adults can either protect or harm the environment, state bodies can play a role in either its protection or degradation.

The significance of a healthy environment is evident from the governance structure in the Republic of Serbia. The Government of the Republic of Serbia has prioritized this concern, dedicating an entire ministry to address it.

The Ministry of Environmental Protection comprises six sectors, each focusing on distinct environmental areas. These include:

- The Sector for Financial Management and Control
- The Sector for Environmental Management
- The Sector for the Protection of Nature, Air, and the Ozone Layer
- The Sector for International Cooperation, Projects, and Climate Change
- The Sector for Waste and Wastewater Management
- The Sector for Supervision and Preventive Action in the Environment

Each of these sectors encompasses specific departments and follows an organizational structure which is further elaborated upon.

**Figure 1:** Organizational chart of the Ministry of Environmental Protection of the Republic of Serbia

Sector for financial management and control	Environmental Management Sector	Sector for the protection of nature, air and the ozone layer	Sector for international cooperation, projects and climate change	Sector for waste and wastewater management	Sector for supervision and preventive action in the environment
Budget department	Environmental management sector	Group for legal affairs in the field of nature protection	Group for legal affairs in the field of international cooperation, projects, and climate change	Group for coordination of harmonization of EU legal regulations in the field of waste and wastewater management	Administrative legal affairs, risk assessment, and
Department for the implementation of economic instruments in the field of environmental protection	Department for legal affairs in the field of environmental management	Department for protected areas, biodiversity, ecological network, and issuance of nature protection conditions	Department for International Cooperation	Group for soil protection, remediation and reclamation, of degraded land	Department of Entrusted Affairs
	Environmental impact assessment department	Department of Biodiversity	Department for European Integration	Department of Waste Management	Department for pollution of industrial facilities, packaging and packaging waste
	Integrated licensing department	Department of Air and Ozone Protection	Department for Environmental Project Management	Department for Water Pollution Protection	Department of Accidents and Chemicals
	Department for protection against major chemical shock		The project management department is financed by the EU fund and international aid in the field of environmental protection	Wastewater Department	Department for supervision of plant management, excessive movement, and special waste streams
	Department for protection against noise, vibrations and non-ionizing radiation		Department of Climate Change		Department of Biodiversity Protection
	Chemicals department		Department for strategic planning in the field of environmental protection		
	Group for the protection of the environment against harmful organisms		Department for circular economy and sustainable development		
	Department for cooperation with local self-government units				
	Department for information and cooperation with civil society in the field of environmental protection				

Source: <https://www.ekologija.gov.rs/organizacija/organizaciona-sema>

Each department within the Ministry is accountable for specific environmental protection aspects, with responsibilities further divided among themselves. However, failures within any sector of this Ministry can lead to potential environmental harm. As evident from the accompanying schematic, the Ministry has undergone extensive decentralization, aiming for specialization and enhancing the quality of work. Nonetheless, it's crucial to note that these state entities aren't the sole potential culprits for environmental damage. For instance, authorities from other ministries could greenlight illegal constructions that endanger the environment or allow industrial connections to water systems, leading to significant environmental crises. The immense responsibility of criminal law protection in this area is highlighted by the fact that the legislator sanctions authorities for negligent practices (Danilović & Lazić, 2018).

Failure to take measures to protect the environment in the Republic of Serbia is marked as punishable behavior and the Criminal Code of the RS stipulates

that any "official person who does not take the prescribed measures to protect the environment, or does not act according to the decision of the state authority to take measures to protect the environment should be punished with a fine or a prison sentence of up to three years." This type of behavior is also punishable if it was done negligently.

Illegal construction and commissioning of facilities and plants that pollute the environment is also recognized as a tort. The Criminal Code stipulates that for this behavior "an official who, contrary to the regulations on protection, preservation and improvement of the environment, allows the construction, putting into operation of buildings or plants or the application of technology that pollutes the environment to a greater extent or over a wider area, shall be punished with imprisonment from six months to five years." If, during this act, "there was destruction of animals or plants on a large scale or environmental pollution to such an extent that it required a long time or large costs to eliminate it, the perpetrator will be punished with imprisonment from one to eight years."

Bringing dangerous substances into Serbia and illegal processing, disposal and storage of dangerous substances is a criminal offense against the environment. If the competent authority appears as the executor, then the legislator has the following provisions: "Whoever, by abusing his official position or authority, allows or facilitates the introduction of dangerous substances or hazardous waste into Serbia, or enables such substances or waste to be transported, processed, disposed of, collected or warehouse, will be punished by imprisonment from one to eight years and a fine." If such behavior leads to major consequences, the punishment can be more severe - imprisonment from two to ten years and a fine.

Illegal construction of nuclear facilities is also a crime against the environment. "Whoever, contrary to the regulations, approves or approaches the construction of a nuclear power plant, nuclear fuel production facility or spent nuclear waste processing facility, will be punished with imprisonment from six months to five years." Such provisions are in the Criminal Code, because the state tries in every way to protect healthy environment, even from its representatives (Danilović & Lazic, 2020).

According to the positive legal regulations of the Republic of Serbia, information about the environment is one more in a series of rights related to the environment, and it can be violated by a state authority. If the authority or its representative does not share information about the same, he will commit a criminal offense of violating the right to information about the



state of the environment and will be punished by a fine or imprisonment for up to one year.

All of the listed illegal behaviors can cause incalculable harmful consequences for the environment. Through court practice, not many such behaviors have been recognized, but through daily reporting by various media, the public is familiar with a multitude of irregular procedures by the authorities, and we are eagerly awaiting the results of the initiated procedures due to professional and scientific analysis. Illegal construction of buildings in protected mountain areas, construction of mini-hydroelectric power plants on rivers that do not meet the requirements, disposal of municipal and industrial waste in places not intended for it, excessive use of pesticides and fertilizers in agriculture, increased air pollution due to the use of inadequate fuels during the heating season, emissions of gases through industrial chimneys without the necessary filters, insufficient control of the correctness of cars and their exhaust gases, insufficient purification of waste water from industry, agriculture and households, excessive use of plastic (Gross & Enck, 2021) and other hard-to-degradable materials accompanied by a minimal degree of recycling and similarly, they are only some of the types of water, air and soil pollution. Other cities and states have had similar problems, and there are very positive examples of how they approached solving them (He, 2023). The authorities should act, prevent and suppress all of this, and since we are witnessing that all of this exists in our environment, we easily come to the conclusion that there is a failure in the work of the authorities.

In conclusion, while the legal framework in Serbia seems comprehensive, its execution needs a revamp. Authorities must act swiftly, with greater precision and care, recognizing the importance of a healthy environment. This responsibility doesn't rest solely on the Ministry of Environmental Protection but extends to other governmental bodies and the general populace. As responsible citizens, we all play a part in preserving our environment.

## **2. SUPPRESSION OF ENVIRONMENTAL POLLUTION AS A PREREQUISITE FOR SUSTAINABLE DEVELOPMENT**

The Criminal Code of the Republic of Serbia identifies the environment as an object of collective protection. Article 260 specifically provides protection against pollution. It states that anyone who "violates regulations on the protection, preservation, and improvement of the environment by polluting the air, water, or land extensively or over a broad area shall be

punished with imprisonment ranging from six months to five years, accompanied by a fine." This article also offers a lenient sanction for offenses committed negligently: a fine or up to two years of imprisonment. Furthermore, if an environmental assault results in "extensive destruction or damage to animal or plant life or pollution that requires significant time or substantial costs to remedy," the perpetrator could face one to eight years in prison along with a fine. However, if the transgression results in considerable destruction or damage to the environment, the sanction is altered slightly to a cumulative punishment of six months to five years in prison and a fine. According to the law, the court may also mandate the offender to take specific measures to protect and enhance the environment within a set timeframe.

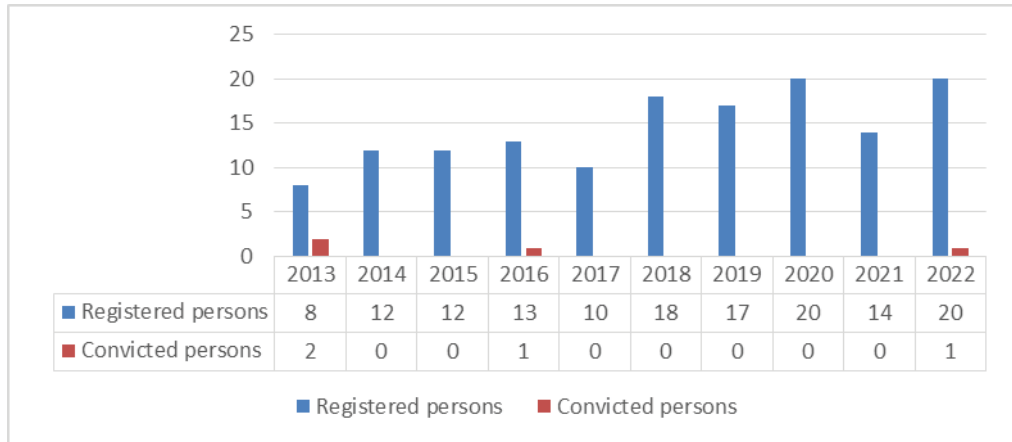
The legislature's decision to use "extensive pollution of water, air, and land" as a condition is designed to differentiate between behaviors punishable by criminal law and those subject to misdemeanor or economic sanctions. In the Republic of Serbia, precise limits indicate the pollution degree and whether it surpasses the permissible level of contaminants. Yet, there is ambiguity in the judicial system regarding the definition of "extensive damage." For instance, a 2002 interpretation by the Criminal Division of the Supreme Court of Serbia established that damages exceeding 4,000,000 dinars qualify as "extensive." However, assigning a fixed monetary value is problematic. Some organisms, for example, may have minimal monetary value, making it challenging to quantify the environmental impact accurately.

We argue that these criminal offenses shouldn't be seen solely as protective measures for the environment. Instead, their intent should be understood in the broader context of safeguarding fundamental human rights, which encompass the right to a healthy environment. The significance of environmental protection, both for current and future generations, is underlined by its constitutional status. Article 74 of the Constitution of the Republic of Serbia asserts that "everyone is entitled to a healthy environment and to accurate and comprehensive information about its state." It mandates that everyone, especially the Republic of Serbia and autonomous provinces, bears the responsibility for environmental stewardship.

Since the inception of this legislation in 1977, there hasn't been significant contention regarding this particular offense, or so it seems. Our analysis couldn't encompass the entire duration since 1977 but did incorporate data from 2013 to 2022. This decade-long period provides an adequate timeframe for discerning patterns and tendencies relating to this issue. The data

examined consisted of the total number of reported and convicted adults for the crime of environmental pollution across the Republic of Serbia.

**Chart 1.** Total number of reported and convicted adults for the criminal offense of environmental pollution in the period from 2013 to 2022 in the entire territory of the Republic of Serbia



Source: Sketch of the author / Republic Institute of Statistics

From the data analyzed, it is evident that over the ten-year period in question, 144 adults were reported for crimes related to environmental pollution, out of which only 4 were convicted. Delving deeper into the sanctions levied, three of these cases resulted in suspended sentences. Most of the initiated criminal proceedings ended with the suspension of the criminal proceedings due to lack of evidence, the principle of opportunity, that is, the principle of inexpediency of criminal prosecution. Only one case (in 2016) resulted in a fine, ranging from RSD 100,000 to 200,000.

While the Criminal Code stipulates considerably stringent sanctions for illicit activities targeting the environment, the prevailing judicial practice seems to lean towards conditional sentences and only occasionally resorts to fines. Such a practice substantially deviates from what's observed in more developed European nations (as noted by Lazić et.al 2021). Unlike Serbian courts, these nations don't employ warning measures as criminal sanctions to such an extent or in the same manner. Warning measures, particularly conditional sentences, can be effective in the resocialization of offenders, but

only when accompanied by certain obligations or protective oversight. Unfortunately, this is seldom the case in the Republic of Serbia. It's important to note that the courts, when meting out a suspended sentence for these kinds of offenses, have the authority to mandate the offender to undertake specific actions to protect, preserve, and enhance the environment within a designated time frame. Regrettably, none of the three scrutinized verdicts took this approach.

## CONCLUSION

Environmental pollution offers no benefits. Both nature and humanity suffer when the word "polluted" follows "environment." Volcanic eruptions, melting glaciers, ozone layer depletion, acid rain, storms, floods, fires, and droughts represent just a fraction of nature's responses to human negligence. For a healthier environment — complete with clean air, fertile soil, and potable water — we need to significantly alter our habits.

While the majority of humanity has unified with the intention of preserving and enhancing the environment, there will always be individuals looking to circumvent regulations. It's the duty of the state to counteract, suppress, and eliminate such illicit behavior. It's especially crucial to ensure that those entrusted with representing the state aren't the ones committing environmental crimes.

Formal legal regulations on environmental protection in the Republic of Serbia are robust, harmonized, and continually updated; there's little to critique on this front. The real challenge lies in the practical implementation of these regulations. As highlighted by our research, a significant gap exists between established norms and reality. Only 2.78% of those reported for committing environmental crimes were convicted, amounting to just 4 convictions out of 144 reported cases over a decade. It's essential to underline the potential vast repercussions of such crimes. Consider, for instance, illicit activities surrounding the construction of a nuclear facility, as discussed earlier in the paper. Such situations demand unwavering diligence from relevant authorities.

In conclusion, we remain hopeful that advancements in this domain will be positive. We anticipate further research, heightened public awareness of environmental harm, and an increasing appreciation of nature and its manifold benefits.

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## **ADVANTAGES AND CHALLENGES OF MANAGING MARKETING AND MARKETING COMMUNICATION IN THE BUSINESS PRACTICE OF COMPANIES IN THE ERA OF DIGITAL TRANSFORMATION**

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**Abstract:** *The extremely rapid development and spread of information and communication technologies (ICT), internet users, online communication worldwide and global competition, have forced companies to put marketing at the center of their business in order to launch more active sales and their online presence in the market emerging a new field of marketing: digital marketing. Digital marketing and marketing communication represent a complex business process with numerous aspects and online activities, which requires the necessity of a holistic and integrated approach of all traditional and digital marketing efforts and other operational functions of the company and efficient management of the entire process. It offers great opportunities for companies in boosting the sales, increasing the profits and business success. From the other side, digital transformation has brought numerous challenges to the companies in managing business and digital marketing activities and the need for the application of all technological innovations and permanent adaptation to new business conditions and customer*

*demands. The aim of this research is to analyze the aspects of marketing and marketing communication in companies in the era of digital transformation, i.e. digital marketing through relevant literature and to give an insight into the advantages and challenges in managing those processes in the business practice of companies, emphasizing their importance for any company as a key field in achieving competitive advantage in the market and business success.*

**Keywords:** *digital marketing, marketing communication, company, managing, technology*

## INTRODUCTION

The dynamics of all technological and socio-economic changes at the global level, intensive growth of internet users and rising level of competition in the market, have created highly complex conditions and demands in managing business for all companies. It has also posed dominant customer influence in the market with fast changes in their buying behaviour and tastes, causing more complexity and multiple communication needs and market performance. Such surcustomes affected the business of companies and forced them to put marketing and marketing communication at the center of their business emerging the digital marketing and its importance (Gbadamosi, 2019).

Contemporary marketing of the companies tends to establish the most supreme conditions and competitive advantage on the market by satisfying the needs and wants of customers through the creation of adequate and high quality products and services better than the competition in order to increase the sales and achieve the best possible financial results and profit growth. It is a very complex business process which includes market research and analysis, effective planning, creation and development of strategy, marketing plan, integrated marketing communication, promotional activities and messages, database, CRM, selection of distribution channels and mass media according to target groups etc. (Kotler, 2019). One of the essential activities in this process is marketing communication, which synergizes all the efforts and marketing activities undertaken by the company (Egan, 2022).

The rapid global development and spread of information and communication technology (ICT) and internet users have drastically changed the marketing and communication of the companies today and have brought a key role of digital marketing (Nesterenko et al., 2023) within the new active two-way communication with customers and approach of customer relationships development (Steinhoff et al., 2021). Hence, digital marketing, as an

integrated part of the marketing process, has become an essential segment of any business worldwide. It also represents a very complex process consisting of numerous areas and online activities within the use of digital media, data and technology (Desai, 2019).

The digital world has increased the needs for market segmentation and targeting market audience and groups (Puthuserry, 2020). Customers are active participants in that process, on which the success of the organization's business depends (Steinhoff et al., 2021). Therefore, today the focus of the creation of marketing programs and marketing communication is the customers and their wants and needs, which implies the optimal selection of marketing mix and promotion instruments with an emphasis on product branding and better positioning on the market (Chalfoun et al., 2017).

In order to achieve results, i.e. successful marketing and marketing communication operations and effects, companies have to manage the entire process effectively and efficiently (Nesterenko et. al., 2023). Namely, complexity of marketing process requires holistic integrated approach within effective marketing management wherein digital marketing and communications has a vital place. In that way all activities and efforts of the companies are well integrated, organized and coordinated which effectively support companies to achieve goals and success in the market (Kotabe et al., 2020).

The significance of digital marketing lies in the fact that it brings a lot of advantages to businesses. Companies are able to respond appropriately and timely to market requirements and demands, achieve better visibility, competitiveness on the challenging global market, brand promotions customer loyalty contributed in that way to advancing sales and financial results (Puthuserry, 2020). From the other side there are also many challenges in this process (Terziu, H. (2020). Companies have to constantly keep abreast of all technological trends and apply them in the marketing process (Cham et al., 2022). Digital transformation is on the highest agenda of the company operations. In the era of digitalization, affiliated with turbulent business conditions on the market, the success of any business depends on the level of digitalization processes applied in business practice, particularly marketing due to the extremely fast development of ICT (Rathore, 2019). Marketing has turned into one of the most technology-dependent fields of the business (Silva et al., 2021). That is why digitalization processes and digital marketing have become an indispensable part of business in order to survive on the highly demanding market (Gbadamosi, 2019).



## **1. DATA AND METHODOLOGY**

This research applied a qualitative research approach based on current relevant literature in the process of data collection and data analysis. It consists of systematic literature review in order to analyze conceptual development of marketing, marketing communication and role of digital marketing in the era of digital transformation. The study explored all key aspects, elements, advantages and challenges of digital marketing in business practice of companies as the main focus.

Qualitative methods are more applicable for this study as they afford better and profound context and understanding of the complex processes and business applications related to the digital marketing and digital transformation, which is not be able to obtain through quantitative data alone (Petticrew et al., 2008). This allowed the research to provide an overview of the existing theory and considerable insights into significance of digital marketing application in companies business practice worldwide as well as perspective and practical business implications of digital transformation on marketing.

By observing and analyzing collecting data, the research synthesizes prevailing theories of marketing, digital marketing, technological developments, networks and practice in order to identify and determine characteristics of patterns, relationships, and trends of digital marketing and its practical implementation.

The study also employed a method of description and comparative analysis of current research findings and definitions in this field, and an analytical-synthetic method in the process of classification and interpretation of research results.

## **2. ASPECTS AND ADVANTAGES OF DIGITAL MARKETING AND COMMUNICATION IN COMPANY BUSINESS PRACTICE**

The global spread of internet users is so high that there is no doubt about the necessity of online presence of the companies (Rathore, 2019). The question is how to make this presence and online communication to be more effective and efficient (Sama, 2019). Today, most information about products and services people search through various internet applications and as well share them. The fact that through the internet, either on a computer or mobile phone, people can watch television, listen to the radio, read the press etc.,

shows how much influence and importance online communication has (Kotabe et al., 2020).

New applications and forms of communication are constantly being developed and applied in practice which raise the importance of digital marketing (Chalfoun et al., 2017). There are many various channels of online communication, including advertising, email and messaging, search engines, and social networks (Egan, 2022). Companies have to be aware of all digital aspects and opportunities. Online promotions are one of the most important segments of integrated marketing communications, which contribute to more successful sales (Nestarenko et al., 2023). On the other hand, the customer today actively participates in that communication, exchanging information, their opinions either good or bad with other online users. That means that the success of digital marketing largely depends on the way of communication and relationship development with the customers, i.e. what kind of content and messages companies send, how they reply on customers requests etc., (Steinhoff et al., 2021).

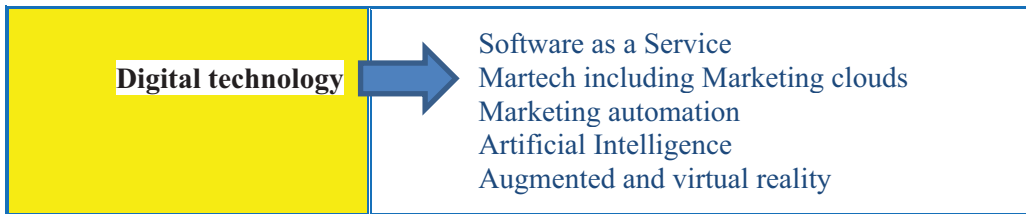
As it has been already pointed out, digital marketing is very complex process which includes various aspects and areas such as (Olsen et al., 2021; Desai, 2019; Chalfoun et al., 2017):

- Website Marketing,
- Email Marketing,
- Social Media Marketing (SMM),
- Search Engine Optimization (SEO),
- Content Marketing,
- Affiliate Marketing,
- Mobile Marketing,
- Paid Advertising & Display Advertising (Banners),
- Pay-per-click (PPC),
- Influencer Marketing,
- Conversational Chatbots etc.

The Table below shows the key pillars, 7Ds, which support effective implementation of digital marketing in companies business practice (Chaffey et al., 2019).

**Table 1.** Pillars of Digital Marketing

<p><b>Digital goals</b></p>	<p>→ Brand goals and strategy                  SMART communication objectives                  Always-on and campaign integration                  Digital transformation and disruption                  Business and revenue models (monetisation)</p>
<p><b>Digital audiences</b></p>	<p>→ Business-to-consumer                  Business-to-business                  Consumer-to-consumer                  Target markets, segments and personas</p>
<p><b>Digital devices</b></p>	<p>→ Smartphone                  Tablet                  Desktop                  Smart speaker and in-home,                  Digital TV and OUT-of-home signage</p>
<p><b>Digital platforms</b></p>	<p>→ Facebook                  Amazon,                  Microsoft                  Google                  Apple                  Other sector specific intermediaries</p>
<p><b>Digital media</b></p>	<p>→ Paid                  Owned                  Earned                  Websites and web application                  Search, social and email marketing                  Content marketing and PR</p>
<p><b>Digital data</b></p>	<p>→ Customer profiles                  Customer behaviours                  Customer value                  Communications preferences                  Big Data</p>



*Source:* Author according to Chaffey et al., 2019.

Every company should provide special attention to social networks, whose influence is enormous today. Their popularity, as well as advertising on them, is growing at the fastest rate compared to other forms of advertising (Sama, 2019). They are an extremely important tool in digital marketing, especially due to the possibility of quickly establishing and developing relationships with customers, receiving feedback from them, targeting groups, thus providing excellent potential for better sales (Cham et al., 2022). Social media, such as Facebook, Twitter, YouTube, Instagram and others, are of particular importance among them (Cartwright et al., 2021), especially for small and medium size companies. The reason for this is that today customers look for the opinion of other users in them, and their comments, reviews and recommendations are often a decisive factor for a purchase. On the other hand, they have a huge number of users in the world and allow consumers to always 24 hours a day, without censorship, for free, and quickly, put and share information and their opinion about any company, their products, services, announcements, as well as to send requests or complaints to the companies (Đurić, 2018).

It is necessary to add that the rapid development of mobile networks and smartphones, as well as the huge number of their users, has opened up new forms of marketing communication and the possibility of targeted promotion according to consumer habits (Kumar et al., 2020). Smartphones have made the expansion of social media, possibilities to use e-mail, television, radio, as well as the creation of new social networks, such as Viber, WhatsApp. In literature and practice, the term mobile marketing is used, which can be realized via SMS and other forms of advertising for mobile phones. The popularity of smartphones is reflected in the fact that it is possible to make online purchases and make mobile payments (Kumar et al., 2020).

Digital marketing brings numerous advantages to businesses. The most significant are (Olsen et al., 2021; Puthuserry, 2020; Kotler et al., 2019):

- providing information quickly about the company and its products and services; numerous channels for fast message transmission
- ability to reach a large number of customers in a short period of time globally without geographical and time barriers, faster finding of new customers
- faster obtaining and collecting information about customers, their preferences, attitudes and characteristics and market research
- better customer relationship management (CRM-Customer Relationship Management), constant interaction with customers and target groups
- precise micro-targeting with the best offer for a certain type of consumer
- creating a better image, reputation and increasing customer loyalty
- strengthening the brand
- greater visibility, positioning and competitiveness on the market
- improving the quality of products and services -receiving feedback on the quality of their products/services in a short period of time including testing of new ones,
- faster adaptation to changes with continuous monitoring of innovations and trends on the market
- increasing the sales and profit
- more effective control of implementation and measurement of marketing results.

Some authors point out that businesses can reduce business costs (Chalfoun et al., 2017). Online business and trade has been expanded today, as it can significantly improve the sales of the companies, but also reduce business costs. E-business and e-commerce primarily refer to numerous commercial and purchasing activities such as distribution, marketing and sales, product servicing. It also includes supply chain management and electronic money transfer (Gbadamosi, 2019). The listed numerous advantages argue and speak in favor of the digital marketing importance in attaining business prosperity of any company.

### **3. CHALLENGES OF DIGITAL MARKETING IN COMPANY BUSINESS PRACTICE**

The online presence of companies is becoming more and more complex almost every day. Digitalization processes and application of new technological trends are necessary in managing successfully any business today, especially marketing (Cham et al., 2022). On the other side, the constant rise of technological and digital trends make it difficult for companies to adopt and apply them quickly.

Digital transformation refers to the the integration of digital technology into all areas of a company business, thus marketing. It is a big challenge for any company to implement and coordinate those processes in practice from application, operational and data management to the end-customer experience and satisfaction (Rathore, 2019). It also requires significant investment, particularly in some softwares, which can cause problems for many small or medium sized companies as they do not have large investment capital. This refers as well as to the new technological trends such as artificial intelligences. AI, as a top emerging trend today, already has significant application in marketing business practice. It greatly supports companies in marketing automation, analysis of large amounts of data (Big Data), customer services, personalization of communication, automatic content and offer generation etc., but demands large investment capital (Kotler, et al., 2021). However, every company has to plan a budget for these processes and digital marketing activities according to their capacity, otherwise they will be able to respond properly to market demands and boost the sales (Silva et al., 2021).

Companies are also facing many challenges and issues in managing digital marketing operations and activities due to the complexity of this process (Terziu, 2020). Changes in customer needs and behaviours are drastically increased. Companies have to respond properly to these requirements. If the companies have a poor adaptation to the technological changes, this will lead to many issues in achieving market performance and financial benefits. From the operational side of view poor organizational structure and the lack of interaction between marketing employees and other departments, deeper integration of digital with traditional marketing, proper marketing expert and IT skills of employees, in most cases leads to the serious problems and reduction of sales volume, thus business (Kotler et al., 2021).

It should be also highlighted the importance of the quality of content and messages according to the type of digital channels. Today customers, i.e.

target groups are receiving too much information through different communication platforms and channels (Terziu, 2020), which they can ignore or even block. This means that it is necessary for the companies to constantly post and update creative marketing content and effective messages adapted and tailored to the characteristics of digital communication channels and platforms. Also they have to respond quickly to all inquiries, especially negative online reviews and complaints, in order to achieve positive outcomes because it can damage the company's reputation. In this way, companies show that they care about consumers, which contributes to a better image, competitiveness and performance, especially on the global market (Đurić, 2018).

This is a very demanding task and requires selection of professional employees and experts with specialized knowledge in the field of digital marketing. Also, marketing management professionals need to understand their customers, have extensive knowledge of IT, methods and strategies that will retain and satisfy consumers, and actively measure results and optimize processes accordingly. Many of these challenges can be overcome with proper training programs (Kotabe et al., 2020).

However, as pointed out in the literature, the biggest challenges are related to the security and privacy issues (Elhai, 2017; Terziu, 2020). Today, there are many diverse frauds and abuses in the digital environment because of IT systems vulnerability and its inadequate security. In marketing, fraud and abuse are present in the field of e-commerce, false company identity, advertising, creation of fake content, reviews of products and services and others (Desai, 2019). Customers are also extremely concerned about their private data and security. Fraud and abuse of customers' privacy data can lead to the creation of false customer identities, assaults and harassments (Elhai, 2017). These violations of user privacy and security, can seriously harm the business of a company with legal consequences and loss of trust among the customers and reputation in public. That is why protection of customers' privacy data should be at the highest level in any company, as well as security of IT systems and digital platforms (Kotler et al., 2021).

It should be added that AI also represents a big challenge in applying marketing business practice especially related to the security and private data, but also to the ethical issues. This particularly refers when it comes to autonomous artificial intelligence that can make decisions without human intervention. AI systems can use discriminatory algorithms or can be misused by hackers for attacks which can lead to bias and discrimination and to significantly harm individuals (customers), groups of people, but also

companies. In the academic, professional and general public currently there is an open debate about *AI topic-concerns, issues and many questions* (Kotabe et al., 2020).

Aforementioned implies that every company should consider and be aware of all digital marketing challenges and issues. They have to address a variety of challenges, including new technological trends and barriers, organizational obstacles, and operational complexities. Overcoming these challenges and problems is crucial for a company in order to stay competitive and innovative in today's rapidly evolving digital world and achieve business success (Chaffey et al., 2019).

## CONCLUSION

The fast changes in the whole world in the era of digitalization has influenced the creation of an extremely complex business climate for companies with increasingly strong competition and dominant role of customers. In order to manage business successfully and respond to all market demands, effective marketing and marketing communication have become of crucial importance for any company.

Rapid and fast development and spread of information and communication technologies emerged digital marketing, as a part integrated marketing process, as a key tool for every company in the fight for survival in the turbulent global market and business success. This implies that companies must permanently monitor and apply innovations related to technological trends, which includes digitalization processes, transformation and digital marketing. The entire process, as an extremely complex and challenging field, requires effective management within a holistic integrated approach in order to gather and connect all efforts of companies, gain the best possible market performance and overcome all challenges and issues.

New information and communication technologies have opened numerous advantages and benefits for establishing more effective communication and realization of marketing activities and goals through digital marketing. It allows the organization to reach a large number of customers in a short period of time without the borders, greater visibility, presence and competitiveness on the market, and thus the possibility to boost the sales, business expansion, including at the global level.

Considering today's prevailing macro-economic conditions and business environment full of instability and rapid changes, as well as the constant



growth of the development and spread of ICT, companies will continue to face remarkable opportunities and challenges for the further development of digital marketing and the entire business in the future. This underlined that future research should pay special attention to ITC innovation and trends in digital marketing.

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## SESSION NO. 3/TREĆA SESIJA

### EUROPEAN TRENDS OF CHANGE IN THE DIGITIZATION OF ACCOUNTING

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**Abstract:** *The digitization process within the framework of the Fourth industrial revolution (Industrial Revolution 4.0) is recognized as a key global trend in modern business. The digital transformation of business is stimulating changes in accounting practice. The accounting profession faces numerous challenges in the era of digitization. This paper contributes to the spread of knowledge about European trends of changes in the digitization of accounting and provides a view of the current digitization of accounting in Germany, Austria, and Switzerland. Changes are moving towards the automation and digitization of financial reporting and non-financial reporting, sustainability reporting. Also, this paper shows*

*progress in the implementation of the fundamental elements of digitalization in accounting and current digitalization technology trends in European countries. The most commonly used digital technologies are Cloud, Blockchain, Big Data, Artificial Intelligence, etc. The research is based on a review of relevant professional and academic literature, and a case study of European companies regarding the digitization of accounting.*

**Keywords:** *digital transformation, digitalization technology, financial reporting, non-financial reporting, sustainability reporting.*

## EVROPSKI TRENDVI PROMENA U DIGITALIZACIJI RAČUNOVODSTVA

**Apstrakt:** *Proces digitalizacije u okvirima četvrte industrijske revolucije (industrijska revolucija 4.0) prepoznat je kao ključni globalni trend u savremenom poslovanju. Digitalna transformacija poslovanja stimuliše promene u praksi računovodstva. Računovodstvena profesija se suočava sa brojnim izazovima u eri digitalizacije. Ovaj rad daje doprinos širenju znanja o evropskim trendovima promena u digitalizaciji računovodstva i daje pogled na aktuelnu digitalizaciju računovodstva u Nemačkoj, Austriji i Švajcarskoj. Promene se kreću ka automatizaciji i digitalizaciji finansijskog izveštavanja, nefinansijskog izveštavanja, izveštavanja o održivom razvoju. Takođe, ovaj rad pokazuje napredak u primeni osnovnih elemenata digitalizacije u računovodstvu i aktuelne trendove digitalnih tehnologija u evropskim zemljama. Najčešće korišćene digitalne tehnologije su: oblak, blokčejn, veliki podaci, veštačka inteligencija, itd. Istraživanje se zasniva na pregledu relevantne stručne i akademske literature, studije slučaja evropskih kompanija u pogledu digitalizacije računovodstva.*

**Ključne reči:** *digitalna transformacija, digitalne tehnologije, finansijsko izveštavanje, nefinansijsko izveštavanje, izveštavanje o održivom razvoju.*

### INTRODUCTION

New information technologies are rapidly transforming the accounting industry by introducing new concepts of *online* and *remote* bookkeeping, process automation, and digitization, a *hybrid* model of accounting consulting that combines human expertise with Artificial intelligence, Business intelligence, and Data analytics software. The need for so-called

*online* and *remote* bookkeeping increased dramatically during and after the COVID pandemic, both in the Republic of Serbia and globally.

In the fourth industrial revolution, an innovative model of accounting is needed, which relies on the automation of work processes and the experience of the accountant. For companies' finance functions, digitalization has mostly appeared as the automation of processes and workflows (Möller et al., 2020). Trends that are becoming more prevalent are digitalization and automation of monotonous tasks. Processes that are most often automated include sales posting, procurement, depreciation calculation, bank reconciliation, lease accounting, payroll, etc.

KPMG's study "*Digitalisation in Accounting*" (2022) is based on a survey of 300 participants from companies in the countries of Germany, Austria, and Switzerland. They looked at the technologies that can play a role in accounting and provided information on the respective degree of their implementation:

- Homogenization of systems, quality of data management, and paperless accounting are intrinsic to digitization;
- Cloud accounting is widely used;
- RPA (*Robotic Process Automation*) is widely used, which contributes to efficiency and quality of work;
- Digitalization of financial and non-financial reporting;
- The automation and digitalization of sustainability reporting.

The Republic of Serbia is adjusting the legal regulations by working on the digitization of services, so that entrepreneurs are obliged to issue accounting documents exclusively in electronic form, and e-invoices (electronic invoices) for legal entities and entrepreneurs are mandatory starting from January 1, 2022 (Published in the Službeni glasnik RS, No. 73/2019, and 44/2021). Accountants' use of adequate software enables reliable *online*, *remote*, or *hybrid* bookkeeping. The qualifications of accounting employees should be developed more and more in the direction of IT (KPMG, 2017).

Previous conceptual studies in accounting research fall short of providing a thorough explanation of the practical developments in the field and the ways in which accounting professionals are adapting to the digital transition. Therefore, this study set out to clarify the real-world effects of digitization in the accounting industry. The unanswered question is: *How do accounting*

*professionals from European countries adapt and react to changes caused by digitalization?*

## 1. MATERIALS AND METHODS

The goal of this paper is to research European trends in the digitization of accounting. This time, qualitative approaches will be applied, supported by an examination of European accounting practices pertaining to digitalization and based on observation and interpretation of the content of previous research in the literature.

## 2. RESULTS AND DISCUSSION

The KPMG study (2022) "*Digitalisation in Accounting*" is based on an online survey of 300 participants (mainly financial directors (CFOs 35%) and chief accountants 41%), who shared their opinion regarding the current and developing trends of digitalization in accounting about existing technologies and systems. In April and May 2022, over 2,500 companies of various sizes and industries from Germany, Austria, and Switzerland were invited to participate in an online survey via the Internet. 51% of companies from Austria, 44% of companies from Germany, and 5% of companies from Switzerland participated in the survey. The majority of the sample consists of companies with more than 10,000 employees (88%). This survey aimed to create a comprehensive picture of the current state and development plans in the era of digitization of accounting. The KPMG study (2022) "*Digitalisation in Accounting*" shows European trends in digitalization in accounting. The study focuses on six key areas of digitalization.

**Table 1.** Digitalisation in accounting in 2022

To what extent is your company carrying out the following action about digitalisation in accounting? (n=300)  
(in percent)

	Already implemented nationwide	Already implemented in some areas	Being implemented	Definitely planned	Not currently planned	No answer
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Homogenization of the system landscape (ERP)	32	32	15	9	10	2
Paperless accounting	20	40	13	18	9	0
Standardization of workflows	13	42	24	13	8	0
Master data quality management	20	32	24	14	9	1
Creation of a uniform database	14	36	21	17	10	2
Abolition of legacy (outdated) systems	24	25	22	17	8	4

Source: KPMG in Germany, 2022

Businesses are implementing the core components of accounting's digitalization in a slow but consistent manner. The study sees the homogenization of the system landscape, e.g. through standardization of the ERP landscape, as the top topic. According to KPMG, 32 percent of the companies surveyed have standardized their ERP landscape, and another 32 percent have implemented homogenization at least in part. The top of the priority list for accounting's digitalization remains paperless accounting. Sixty percent of the companies have already either fully or partially implemented this.

**Table 2.** Significance of current technology trends in 2022

To what extent does your company employ the following technologies or technology-based solutions in accounting? (n=300) (in percent)

	Already using nationwide	Using in pilot projects	Definitely planning to use	Under discussion	Not currently planned	Not aware of any advantage of the technology/IT solution	No answer
Cloud	20	30	12	18	15	1	4

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solutions							
In memory databases (e.g. SAP S/4 HANA)	16	15	19	13	24	9	4
Self-service reporting	11	19	11	23	27	4	5
Rule-based systems - Robotic Process Automation	8	20	7	25	32	4	4
Big data analysis tools	8	17	7	27	33	3	5
Artificial intelligence (machine learning/neural networks)	2	15	8	23	43	5	4
Business process management (BPM)	4	12	14	23	37	6	4
Virtual reality tools for visualization of key figures	3	8	3	17	54	9	6
Blockchain technology	1	1	3	13	62	11	9

*Source:* KPMG in Germany, 2022

In-memory databases such as S/4HANA continue to play an important role. However, there is still a lack of implementation, even though steady progress has been made in recent years. So far, 16 percent of the companies surveyed are already using in-memory databases such as S/4HANA in their day-to-day business, and another 15 percent have implemented initial pilot projects. A roughly equal proportion of companies (32%) are planning a migration or discussing a migration project. For the remaining 37 percent of companies, a change is currently not an issue or the added value of the in-memory database is not seen.



Distributed Ledger Technology - DLT or Blockchain Technology enables the creation, secure transfer, and storage of information between different locations, organizations, and geographical areas (Dai & Vasarhelyi, 2017). Blockchain and virtual reality are still hardly used in accounting.

Big data and data visualization in accounting are powerful tools for improving business processes, and financial performance, minimizing business risks, and making informed business decisions. The power of Big data lies in the ability to quickly and reliably detect trends, patterns, and risks that are difficult to see in smaller volumes of data (Payne, 2014; Al-Htaybat & von Alberti-Alhtaybat, 2017; Richins et al., 2017).

According to Dilla et al. (2010), data visualization in financial reporting is increasingly common. Companies use data visualization tools to better understand the large amount of data stored in their information systems. For example, tables, graphs, and other visual indicators are usually suitable for use.

Artificial intelligence (AI) can be successfully applied to more structured and repetitive tasks where the application of human knowledge and expertise is not extremely difficult and demanding. The problem in the implementation of AI projects in accounting is related to insufficient training or insufficient cooperation of IT and accounting experts, heterogeneity of documents, and outdated systems and software (KPMG, 2020).

Non-financial reporting still lacks the support of IT. The majority of the companies surveyed have not yet implemented any digital processes for this task. Most of the companies (83 percent) that report on their non-financial information state that for the most part they use manual processes for this task and at present have a degree of digitalization of up to 50 percent. In addition to standardizing and streamlining current systems, a greenfield approach to accounting digitization lays the groundwork for the effective adoption of sustainability reporting. There is a particular focus on sustainability reporting, the disclosure of information to explain the effect of environment, social and corporate governance, and CO2 emissions (KPMG, 2022).

**Table 3.** Use of cloud computing services in enterprises, by type of cloud service and size class, EU, 2021

(% of enterprises)

	All enterprises	Small	Medium	Large
Buy cloud computing services used over the internet	41	38	53	72
E-mail	32	30	41	56
Storage of files	27	25	36	53
Office Software	25	23	35	53
Security software applications	24	22	31	40
Hosting the enterprise's database(s)	19	17	24	36
Financial or accounting software applications	19	19	22	23
CRM software applications	11	9	16	27
Computing power for the enterprise's software	10	8	14	27
ERP software applications	10	8	15	19
A platform for application development, testing, or deployment	9	7	14	27

Source: Eurostat, 2021

Most companies in the Republic of Serbia decide to transfer the accounting function to external agencies and audit firms. Outsourcing brings with it many benefits, allowing companies to better focus on their resources, increase profitability, and save costs. Bookkeepers in the Republic of Serbia use all the advantages of digitization to offer clients safe and fast solutions. Posting of business changes is almost completely digitized and is done in accounting software. Digitization introduces numerous changes in the accounting industry such as e-invoicing, e-fiscalization, digital remittances, etc. Process automation is useful but cannot eliminate human expertise, especially in accounting. One of the latest accounting trends is combining technology and financial consulting. This *hybrid* approach allows accountants to gain a much better insight into the company's operations by using various Artificial intelligence, Business intelligence, and Data analytics software. (PKF Srbija, 2022).

## CONCLUSION

The practice, education, and skills of accounting are greatly impacted by digital technology. Due to internal company regulations, the complexity of business processes, the high cost of new technologies, and other factors, the use of new digital technologies in Europe has been relatively low in recent years. Because so many internal processes are now digital, businesses are now well-positioned in the homogenization of system landscapes and processes. An increase in self-service reporting and an increased use of in-memory databases can be observed. Virtual reality and blockchain are still hardly used in accounting. The implementation of e-invoicing and e-fiscalization in the Republic of Serbia is an important step towards modernizing digitizing business and accounting practices. One of the latest accounting trends is combining various Artificial intelligence, Business intelligence, and Data analytics software and financial consulting.

Future research should examine the role that new digital technologies play in both financial and non-financial reporting, as many companies still have room for further automation, particularly in the area of non-financial reporting. With more businesses going digital, more employees are working from home offices, which calls for the protection of the resulting data. This is one more reason why accounting and scientific research on the subject of cyber security should become more and more relevant.

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## THE IMPACT OF DIGITALIZATION ON EMPLOYMENT AND LABOUR SKILLS IN EUROPEAN UNION

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**Abstract:** *Digital technologies have influenced the development of economy and business processes in different ways requiring from enterprises digital transformation. Working in digital environment has changed types of work organization from labour-intensive to more technology intensive. The adoption of digital technologies is related to the concern about the possible substitute of wide range of occupation at an accelerating rate. The digital transformation could cause polarization of labour market taking over primary routine, repetitive jobs performed by low-skilled workers and increasing employment of highly skilled workers. The aim of this paper is to examine the impact of digitalization on employment and employees' skills in the European Union. More than half of enterprises in the EU use social media in their business processes while the share of enterprises, which use artificial intelligence is very small. There are significant differences between large enterprises and small and medium sized enterprises in using digital technologies. Accelerating digitalization in business could cause the labour market disparities needed to provide necessary skills for working with digital technologies. Almost a third of individuals in the EU have the above basic overall digital skills. The problem-solving skills and creating digital contention*

*skills have the half of individuals. For achieving the digital leadership and preparing labour force for working in digital environment, it is necessary to provide appropriate training for ICTs skills development by enterprises. This type of training provides the quarter of all enterprises in EU countries. The challenge for policy makers is to create ways for stimulating all enterprises (particularly SMEs) to invest more assets in adopting digital technologies in business processes and ICTs skills upgrading programs.*

**Key words:** *artificial intelligences, digitalization, employment, European Union, ICTs skills.*

## INTRODUCTION

Digitalization is affecting every aspect of modern work. For many professions more advanced digital skills are necessary in relation to increasing dependence on the internet and digital technologies. Digitalization has changed workplaces moving from labour-intensive to more technology-intensive types of work organization. The companies and institutions have required from their employees the permanent improvement of digital skills for developing innovations and remaining market competitive. The increase of remote and platform work during Covid-19 crises has contributed to the digital transformation of working conditions and content of jobs.

For maintaining global competitiveness and providing digital leadership, it is necessary that EU members empower business and people for digital transformation. For that reason, the European Commission presented Digital Compass, with clear goals and principles that EU expected to reach by 2030. The digital targets are defined in the field of providing appropriate skills, digital transformation of business, secure and sustainable digital infrastructures, and digitalisation of public services. The aim of this paper is to examine the impact of digitalization on employment and employees' skills in the European Union. The rest of the paper is organized as follows: Section 2 shows the diversity of digital technologies and their main opportunities and risks for employment. Section 3 presents digital targets of proposed Path to the Digital Decade and overview of present level of individuals digital skills as well as the extent of using the different digital technologies by enterprises in EU. Section 4 review the study findings on the employment impact of digital technologies and analysis labour digital skills and necessary training and professional development for upgrading labour ICTs skills.

## **1. DIGITALIZATION AND DIVERSITY OF DIGITAL TECHNOLOGIES**

Digitalization of work environment includes the various types of digital technologies ranging from digital communication and information tools (ICT) to Artificial Intelligence (AI) and robots. These technologies have a significant role in shaping the work, from platform work to the gig economy and algorithmic management. Industrial robots have been associated with automation of routine manual tasks substituting low and middle-skill workers. Artificial Intelligence has become the central topic of public and academic debate because of multiple risks and impacts on labour market and worker displacement. There is no single definition of Artificial Intelligence bearing in mind the various understandings of this term. Some studies explain Artificial Intelligence as automation technology of increasingly complex tasks, while other studies emphasis AI as general-purpose technology which provides incorporating general automation in business through hardware and software applications. In most AI applications, the software relies on highly sophisticated algorithmic techniques of finding data patterns and making predictions of the future. This enables the increasingly automation the non-routine cognitive tasks that might affect high-skilled workers (Georgieff and Hye). Although Covid-19 pandemic accelerated adoption of digital models of business, the enterprisers in European countries have included digital technologies in work process in less extent compared to the United States and China. ETUI survey shows that only 1.1 percent of working age population in European countries can be classified as "main platform workers". (Konle-Seidl and Danesi). In addition, only 55 percent of small and medium-size enterprises reached at least basic level in adoption of digital technologies.

Digitalization can affect work and employment through various pathways. One of them is automation of work (replacement of human labour with machine for some types of tasks within production and distribution process). The use of digital technologies enables the algorithmic control of machines. There is increasing use of advanced robotics in the form of remotely controlled robots in automotive sector, food preparation industry and business logistics. The second pathway is digitisation of processes (conversion of information to a digital format through AI technologies, cloud computing and Big Data). Digitisation of processes enables wide possibilities of processing, storage, and communication of digital information. However, 3D printing, augmented and virtual reality (AR/VR) and the internet of things (IoT) have not widely presence in economy because of high costs and

skills requirements. In EU countries in 2020, only 5 percent of enterprises with at least 10 employees used 3D printing and 18 percent of enterprises used internet of things mostly in utilities, telecommunication and transport and storage. The third possible pathway is coordination by platforms using digital networks for coordinating economic transactions in an algorithmic way (platform work). The platform work has dynamic growth, but its scale is still rather small. Most research indicates that 1-2 percent of labour force has been engaged in platform work as main job and 10 percent as occasionally job (Eurofound).

The increasing presence of digital technologies in the economy causes the discussion of academic and general public in considering the possible benefits and risks of their impact on employment. Digital technologies could replace labour-intensive, repetitive, heavy, and dangerous tasks. In addition, it could create a new emerging occupation and increase the highly value-added employment. On the other hand, digitalisation could decrease the employment quality and cause polarization of labour market (Konle-Seidl and Danesi).

**Table 1.** Main opportunities and risks for employment

<b>Opportunities</b>	<b>Risks</b>
<b>Digitalisation</b>	
Increased competitiveness and sustainability of digitalised establishments Employment opportunities and job security in digitalised establishments for high-skilled workers	Job loss for workers in low-skilled routine-heavy jobs Skill shortages Labour market polarization Increase in involuntary atypical employment
<b>Automation</b>	
New employment opportunities Mitigation of labour shortages Indirect job creation in other industries	Decline in jobs with a high level of routine tasks Decreasing of employment quality
<b>Digitisation</b>	
Used of data generated through IoT for improving management decisions and supply chains Job creation for specialist and newly emerging occupational profiles	Decreasing employment quality
<b>Platforms</b>	
Access to the labour market and income for vulnerable groups Fostering self-employment	Misclassification of workers employment status Contribution to labour market segmentation and deskilling



*Source:* Eurofond (2021). The digital age: Implications of automation, digitisation and platforms for work and employment. Challenges and prospects in the EU series, Publication Office of the European Union, Luxembourg, p.14.

## 2. PATH TO THE DIGITAL DECADE

To maintain the competitiveness in global economy and market, EU countries need to intensify the efforts of empowering businesses and people to do digital transformation by building technological capabilities. For achieving the digital leadership, it is necessary to build sustainable digital infrastructure regarding connectivity, microelectronics, and the ability to process vast data. The building of digital infrastructure includes, among the rest, the increase production of cutting-edge and sustainable semiconductors including processors. In addition, the EU must invest in new quantum technologies. Gigabit network is the precondition of adopting clouding, AI and Big Data in business processes. It is necessary to create investment that is more favourable and financial conditions encouraging businesses, particularly small and medium-size enterprises, to adopt digital transformation. Digital transition of businesses must be followed digitally capable employees. Basic digital skills are essential for the work force as well as an opportunity to acquire the new special digital skills to get quality jobs. Advanced digital skills require digital training and education of work force. In 2019, there were 7.8 million ICT specialists with an annual growth rate of 4.2 percent which is a serious obstacle for businesses to make investment due the lack of work force with the adequate digital skills (European Commission, 2021). To secure digital sovereignty the European Commission presented Digital Compass, by March 2021, with clear goals and principles that EU expected to reach by 2030. These digital targets are expected to provide digital transformation of the economy.

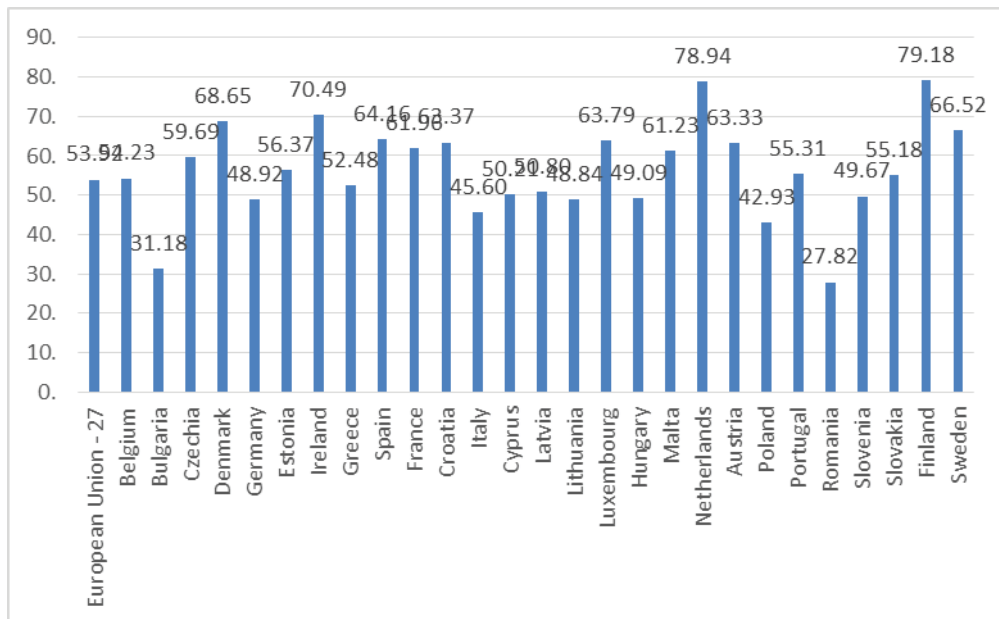
**Table 2.** The targets of the proposed Path to the Digital Decade

Skills	Digital transformation of businesses
Basic digital skills: minimum 80% of population ICT specialists: 20 million + gender convergence	Tech up-take: 75% of EU companies using Cloud/AI/Big Data Innovators: growing finance to double EU unicorns Late adopters: more than 90% of SMEs reach at least the basic levels of digital intensity

Secure and sustainable digital infrastructures	Digitalisation of public services
Connectivity: gigabit for everyone, 5G everywhere Cutting edge Semiconductors: double EU share in global production Data – Edge & Cloud: 10,000 climate neutral highly secure edge nodes Computing: first computer with quantum acceleration	Key public services: 100% online e-Health: 100% of citizens having access to medical records Digital identity: 80% citizens using digital ID

Source: European Commission (2022). Digital Economy and Society Index (DESI) 2022. pp. 12.

**Figure 1.** Individuals with basic and above basic digital skills, in %, in 2021

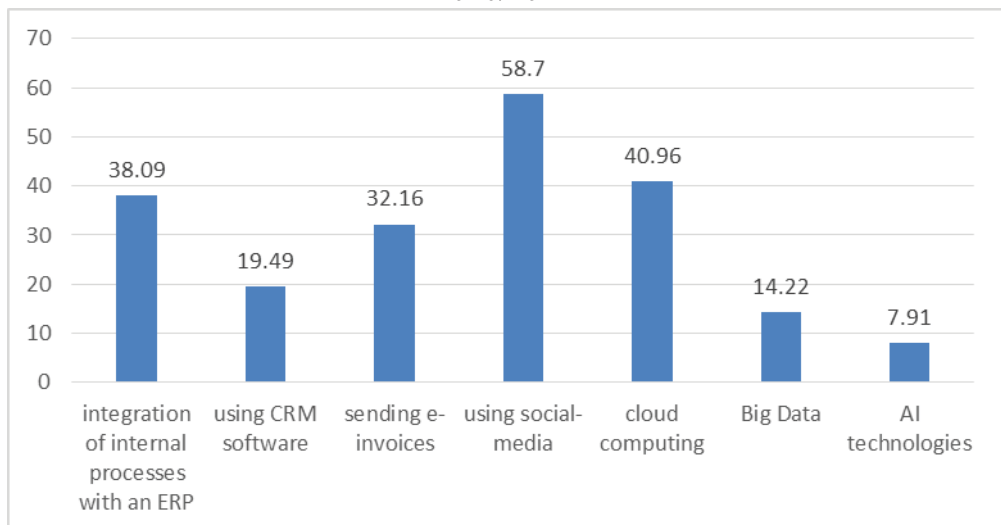


Source: Eurostat

According to Eurostat data, a large part of labour force lacks basic digital skills because in 2019 only 54 percent of EU population possessed at least basic digital skills. The Finland and Netherlands are the nearest of achieving the proposed target of 80 percent, while Bulgaria and Romania have very low rate (31 and 28 percent respectively).

Recruiting ICT specialists in the EU labour market is still difficult. In 2021, there was 8.9 million employed ICT specialists which present 4.5 percent of labour force. The highest proportion of ICT specialists in labour force has Sweden (8 percent) and Finland (7.4 percent). However, the highest number of ICT specialists is reported in Germany (2 million ICT specialists accounting for 22.5% of the EU total), in France (1.2 million ICT specialists accounting for 13.9% of the EU total) and in Italy (0.8 million ICT specialists accounting for 9.5% of the EU total). In addition, there is severe gender gap with only 19 percent employed ICT specialists being women. The degree of integration of digital technologies by business among EU countries is very different. In Sweden and Finland 86 and 82 percent of small and medium-size enterprises have basic level of digital technology, while in Romania and Bulgaria this rate is the lowest. In the EU, only 55 percent of small and medium-size enterprises apply at least basic level of digital technology (European Commission, 2022). More than half of enterprises have used social media in business. However, the data show that the European countries have weaknesses in adopting advanced digital technology. Almost 41 percent of enterprises have used cloud computing in business processes, while the share of enterprises which have adopted AI and big data is significantly lower (8 and 14 percent respectively).

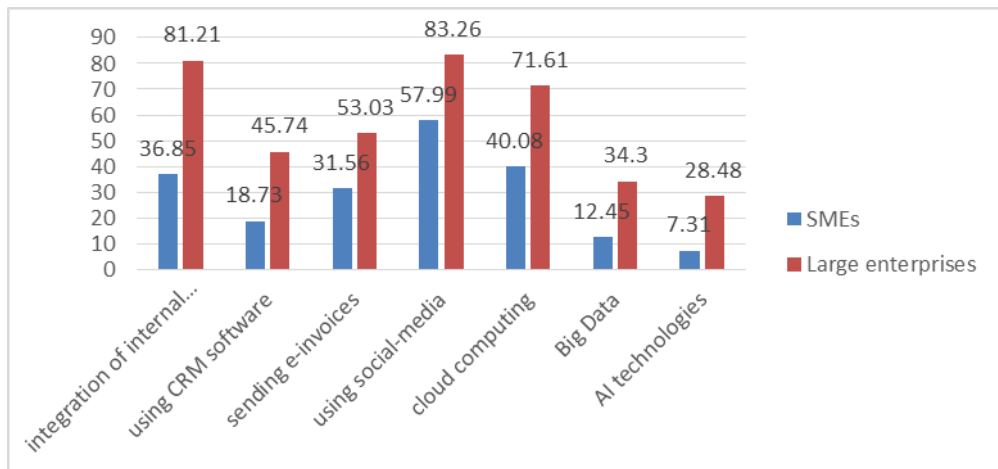
**Figure 2.** Enterprises in EU using digital technologies, in %, in 2020/2021



Source: European Commission, Digital Scoreboard

There are severe differences in adoption of digital technologies between small and medium-size enterprises and large enterprises. Electronic information sharing through enterprise resource planning (ERP) is more common between large enterprises (81%) than SMEs (37%). In addition, only 19% of SMEs use Customer Relationship Management (CRM) software, while this rate among large enterprises is higher (46%). The percentage of enterprises which, use social media in business is high. However, there are significant differences in number of used social media between SMEs and large enterprises. Two or more social media use only 28% of SMEs compared to 61% of large enterprises. Almost 72% of large enterprises and 40% of SMEs incorporated cloud technologies to improve their operations and reduce the costs.

**Figure 3.** Enterprises in EU using digital technologies, in %, in 2020/2021



Source: European Commission, Digital Scoreboard

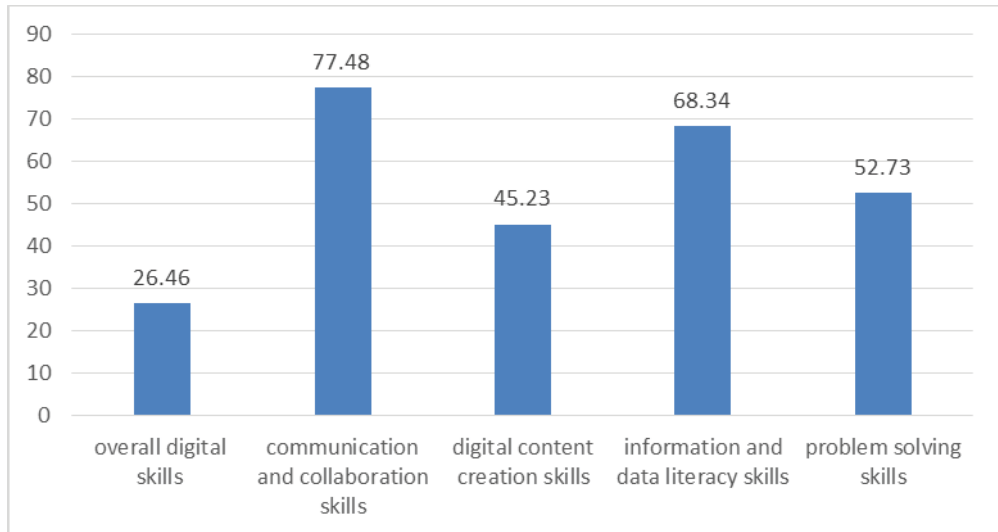
However, this share of enterprises is smaller if purchasing of cloud computing services is limited to sophisticated or intermediate level of these services (33% of SMEs and 60% of large enterprises). SMEs exploit big data and AI technologies to a limited extent (12.5% and 7.3% respectively). Almost a third of large enterprises use big data and AI technologies. One of the possible reasons for the limited adoption of advanced technologies (big data and AI technologies) is availability of labour force with advanced digital skills, data protection and liability issues.

### **3. IMPACT OF DIGITALIZATION ON EMPLOYMENT AND LABOUR SKILLS**

The increasing progress of digital technologies causes concern about possible effects of digitalization on employment and worker displacement. The most concerns are related to the substitute of wide range of occupation at an accelerating rate. Many studies find that digitalization impact on workplace among workers with different skills levels. Increasing applying digitalization in business is associated with the increasing employment of high-skilled workers and reducing employment of low-skilled workers. OECD research finds that, during the period of 2012 to 2019, greater use of AI technology in business processes causes the rise of employment in occupations where computer use is high. The automatization of business processes tended to take over primarily routine tasks performed by low-skilled workers reducing the employment of these workers (Georgieff and Hye). Acemoglu et al. do not detect any aggregate relationship between AI adopting and employment or wages level in US economy (Acemoglu et al.). On the other hand, Frey and Osborne find that about 47 percent of total US employment is at risk of being substituted by ICTs within the next 20 years (Frey and Osborne). However, the study of changing the occupations in Ireland identified in Frey and Osborne work as the jobs of risk of being substituted by ICTs shows that average occupational change among fully automatable occupations was -2% (Cedefop). Analyzing the German economy, Gentz and Schnabel find that employment stability is lower in enterprises which investing in digital technologies than in non-investing enterprises. The new digital technologies mainly affect workers with non-routine tasks and in high-skilled occupations, which were regarded as safe for employment (Gentz and Schnabel). The research of Batisti et al. shows higher substitutability between robotic capital and unskilled labour compared to skilled labour. According to their results, middle-skill workers employed in intermediate routine tasks are the most vulnerable to robotization (Batisti et al.). Madzar (2023) finds short-term statistically significant relationship between labour productivity and computer programing sector in Serbia in her study.

Having the skills for efficiency use of AI or not may be the cause of increasing labour market disparities. For that reason, the key policy challenge will be providing that workers have necessary skills for working with new digital technologies. So, internal training and life-long learning and professional development should be of the most importance.

**Figure 4.** Individuals with above basic skills in EU, in %, in 2021



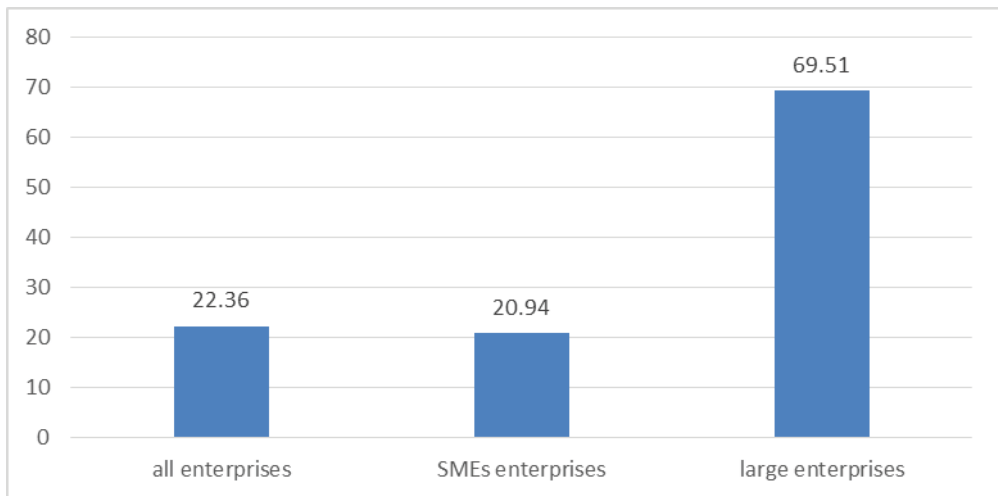
Source: European Commission, Digital Scoreboard

According to data from Digital Scoreboard (Figure 4.), above basic overall digital skills have only 26% of individuals in EU. In addition, there are significant differences between EU members. Thirteen member states have a share above the EU average. Among them, the highest percentage of individuals with above basic skills have Netherlands (52%), Finland (48%) and Ireland (39%), while the lowest share have Romania (8%) and Bulgaria (7%). The overall digital skills as indicator consist of selected activities related to internet or software use. The most individuals in EU have communication and collaboration skills (77%), information and data literacy skills (68%). However, above basic digital content creation skills have 45% of individuals in EU. The Netherlands, Croatia, and Finland have the highest share (64%), while the percentage of individuals with those skills in Romania and Bulgaria is only 22%.

Having in mind that only 26 percent of individuals in EU have above basic overall digital skills, the challenge for achieving targets of the proposed Path to the Digital Decade and digital leadership in future will be providing necessary skills for working in digital environment. It is expected that enterprises provide appropriate training for their employees to develop or upgrade their digital skills. According to Digital Scoreboard data, only 22

percent of enterprises in EU provide training for improving ICTs employees' skills. In Scandinavian members, the share of enterprises which provide training is the most (Finland 39.8%, Sweden 34%, and Denmark 33%). In Bulgaria and Romania that share is significantly smaller (only 9% and 8% of all enterprises) acquiring additional efforts for providing incentives for enterprises to invest more assets in improving digital skills for their employees. Having in mind that large enterprises use digital technologies in business processes in larger extent than small and medium size enterprises, it is expected that more large enterprises provide training and life-long developing digital skills for employees. Almost 70 percent of large enterprises in EU provide upgrading ICTs skills training, while that kind of training is providing by 21 percent of small and medium-size enterprises. In seven EU member states the share of large enterprises provide digital skills training is very large, accounting for 80 and more percent (Finland and Belgium 87%, Slovenia 81%, Denmark, Poland, Sweden, and Czechia 80%).

**Figure 5.** Enterprises provide training to their personnel to develop/upgrade to their ICT skills, in EU, in %, in 2022



Source: European Commission, Digital Scoreboard

## CONCLUSIONS

Digitalization can affect work and employment through various pathways. There are automation of work (replacement of human labour with machine for some types of tasks within production and distribution process), digitisation of processes (conversion of information to a digital format through AI technologies, cloud computing and Big Data) and coordination by platforms using digital networks for coordinating economic transactions in an algorithmic way (platform work). Digital technologies could replace labour-intensive, repetitive, heavy, and dangerous tasks. In addition, it could create a new emerging occupation and increase the highly value-added employment. On the other hand, digitalisation could decrease the employment quality and cause polarization of labour market. Many studies find that digitalization impact on workplace among workers with different skills levels. The greater use of AI technology in business processes causes the rise of employment in occupations where computer use is high. The automatization of business processes tended to take over primarily routine tasks performed by low-skilled workers, reducing the employment of these workers. In the EU, a large part of labour force lacks digital skills because in 2019 only 54 percent of EU population possessed those skills. The above basic overall digital skills have only 26% of individuals in EU. Recruiting ICT specialists in the EU labour market is still difficult because they present 4.5 percent of labour force. On the other hand, the degree of integration of digital technologies by business is very different. The European countries have weaknesses in adopting advanced digital technology. Almost 41 percent of enterprises have used cloud computing in business processes, while the share of enterprises which have adopted AI and big data is significantly lower (8 and 14 percent respectively). Large enterprises applying digital technologies in business processes in increasing extent compared to small and medium-sized enterprises. The great challenge in future will be providing that workers have necessary skills for working with new digital technologies. Having in mind that only 26 percent of enterprises in EU provide training for development and upgrading ICTs employees' skills, the policy makers should consider the possible ways of stimulating all enterprises (particularly SMEs) to invest more assets in adopting digital technologies in business processes and to prepare their employees for working in digital environment.

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## UTICAJ DIGITALIZACIJE NA ZAPOSLENOST I VEŠTINE RADNE SNAGE U EVROPSKOJ UNIJI

**Apstrakt:** *Digitalne tehnologije su na različite načine uticale na razvoj privrede i poslovnih procesa zahtevajući od preduzetnika digitalnu transformaciju. Rad u digitalnom okruženju promenio je vrste organizacije rada od radno-intenzivnih ka više tehnološko intenzivnim. Primena digitalnih tehnologija povezana je sa zabrinutošću o mogućoj ubrzanj zameni većeg broja zanimanja. Digitalna transformacija može uzrokovati polarizaciju tržišta rada preuzimajući pre svega rutinske, ponavljajuće poslove koje obavljaju niskoobrazovani radnici i povećavajući zaposlenost visokoobrazovanih radnika. Cilj rada je da ispita uticaj digitalizacije na zaposlenost i veštine zaposlenih u Evropskoj uniji. Više od polovine preduzetnika u EU koriste socijalne medije u poslovnim procesima dok je udeo preduzetnika koji koriste veštačku inteligenciju veoma mali. Postoje značajne razlike između velikih preduzetnika i grupe malih i srednjih preduzetnika u korišćenju digitalne tehnologije. Ubrzana digitalizacija biznisa mogla bi prouzrokovati nejednakosti na tržištu rada usled čega je potrebno steći veštine neophodne za rad sa digitalnim tehnologijama. Skoro trećina pojedinaca u EU ima digitalne veštine iznad nivoa osnovnih. Veštine rešavanja problema i kreiranja digitalnog sadržaja poseduje polovina pojedinaca. Za postizanje digitalnog liderstva i pripremu radne snage za rad u digitalnom okruženju neophodno je da poslodavci obezbede odgovarajuće obuke razvoja IKT veština. Ovu vrstu obuke obezbeđuje četvrtina preduzetnika u zemljama EU. Izazov za kreatore politike je da pronađu načine stimulisavanja svih preduzetnika (posebno malih i srednjih) da ulože više sredstava u primenu digitalne tehnologije u poslovnim procesima, kao i u programe usavršavanja IKT veština.*

**Ključne reči:** *veštačka inteligencija, digitalizacija, zaposlenost, Evropska unija, IKT veštine.*

## DIGITAL TRANSFORMATION AND THE ECONOMY OF SERBIA

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**Abstract:** *Digital transformation radically changes the basic assumptions of the functioning of modern society and the economy. The intensive growth of the scope of digital technologies in the last decade has led to structural changes in the economic activities of numerous countries in the world. Digital technologies enable companies to gain a competitive advantage, improve their products and services, and expand their markets. It has become very important for countries around the world to plan and successfully lead digital transformation in order to maintain the competitiveness of their economies and improve the living standards of their populations. The process of digital transformation leads to numerous problems and challenges in the world and in Serbia, which require research and answers. The authors research the digital transformation of the economy of Serbia. The paper considers and analyzes the challenges of digital transformation faced by the domestic economy. The aim of the paper is to determine the state of the domestic digital economy and identify the problems that stand in the way of a successful digital transformation in Serbia. In particular, the position of domestic digital*

*economics in relation to Europe is analyzed. The authors suggest the main directions for the digital transformation of the economy of Serbia.*

**Key words:** *digital transformation, digital economy, digitalization, information and communication technologies, Serbia.*

## INTRODUCTION

Digital transformation implies social, economic, cultural, and other changes conditioned by the development of digital technologies (Kim, Choi, & Lew, 2021, p. 5). Digital technologies are changing production, trade, and the labor market. At the macro level, digital transformation implies the emergence of new digitally oriented sectors, on the one hand, and changes within traditional sectors of the economy (agriculture, tourism, transport, etc.) conditioned by digital technologies, on the other hand (UNCTAD, 2019, p. 4). At the micro level, digital transformation is the process of the adoption and implementation of digital technologies by companies in order to create new and modify existing products, services, and operations. The following technologies are in question: the Internet of Things, cloud computing, digital platforms, big data analytics, blockchain, robotics, and artificial intelligence. The benefits of digital transformation are increased efficiency, cost reduction, business agility, and added value creation. There is a clear relationship between digital transformation and GDP growth. Digital transformation is all about leveraging knowledge and integrating it across all business areas to create new value (Ilić & Đurić, 2023, p. 96-97). Therefore, digital transformation does not only represent the use of new digital technologies but also includes overall changes within the business (Gorenšek & Kohont, 2019, p. 104). Digital transformation implies the integration of digital technologies and business processes in the digital economy. Digital transformation is the driving force of the digital economy.

Regarding digital transformation and the development of the digital economy, Serbia has been making intensive progress in the last five years. Progress has been made in terms of the expansion of digital infrastructure, the use of the Internet and digital public services, and the building of the institutional and legal framework. However, progress is also achieved in other countries. Serbia lags behind in comparison to Europe, especially when it comes to the impact of digital technologies on the overall economy of the country. Numerous sectors of the economy are unprepared to adopt new technologies. Serbia has a pronounced digital skill deficit. Problems exist

regarding the development of the digital market and e-commerce. Serbia represents a moderate digital innovator (Đorđević, 2020, p. 73).

The aim of the research is to identify the state of the digital transformation of the economy of Serbia and formulate the main directions of the digital transformation of the economy. The research is related to determining the challenges of digital transformation in Serbia. In particular, the authors consider and analyze the factors influencing the development of the digital economy: the availability of ICT, the population's ability to use technology, economic indicators, business indicators, the level of digital skills, etc. It is important to look at the readiness for digital transformation by considering new digital technologies, digital infrastructure, trust and security in the digital world, and human capital.

Besides the introductory part, the paper consists of three sections and a conclusion. In the second part of the paper, the data and research methodology are considered. The third part of the paper presents an analysis of the results of the digital transformation of Serbia. In the fourth part of the paper, recommendations for the transformation of the economy are given. Concluding considerations are given at the end of the paper.

## **1. DATA AND METHODOLOGY**

The paper uses the methods of induction, deduction, analysis, and synthesis, especially the comparative method. The comparative method is used to assess the position of the digital economy of Serbia and its transformation in relation to the countries of the European Union.

The research uses indicators and data from the Network Readiness Index report, the Global Innovation Index report, the UNCTAD, World Bank, and Eurostat databases. The Statistical Yearbook of the Statistical Office of the Republic of Serbia, the report of the Statistical Office entitled Usage of Information and Communication Technologies in the Republic of Serbia, and data from various strategies for the development of the digital society from the Official Gazette of the Republic of Serbia are used as domestic sources.

The Network Readiness Index was developed by the World Economic Forum. It is used in the paper as a measure of digital transformation. The Network Readiness Index measures a country's readiness to apply and use ICT for economic development and strengthening competitiveness. The index assesses the impact of ICT on individuals, societies, businesses, and governments. The Network Readiness Index includes four pillars:

technology, people, governance, and impact. These pillars assess the basic level of ICT in a country, the access and use of ICT by people and businesses, security and regulation in the digital sphere, and the economic and social impacts in the country (Portulans Institute, 2019, p. 12-13, 20-22).

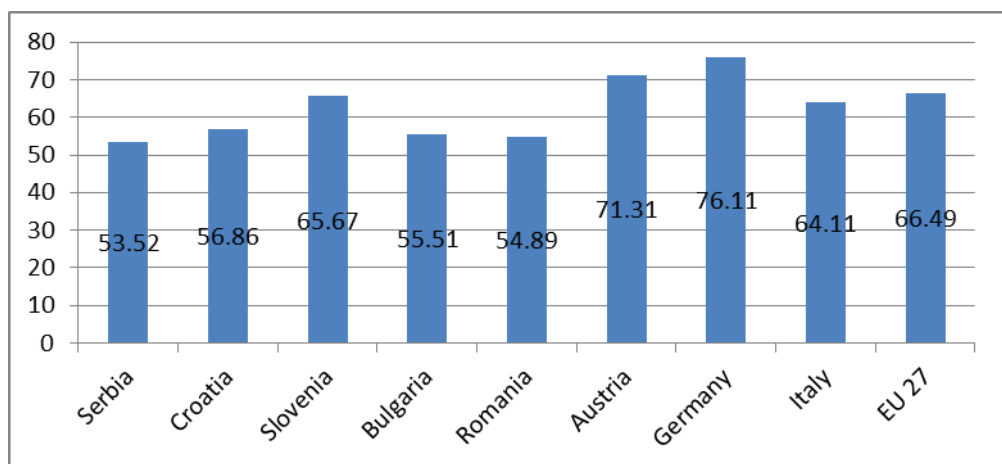
Indicators and data from the Global Innovation Index report and the UNCTAD, World Bank, and Eurostat databases include indicators of the economy, foreign trade, and labor markets, as well as indicators of the availability and use of ICT. Indicators and data from domestic reports and strategies include indicators and values on the availability and use of ICT in the population, business, and state sectors.

## 2. ANALYSIS OF THE DIGITAL TRANSFORMATION RESULTS

We begin the analysis of the digital transformation of Serbia by considering the network readiness index, its pillars, and its indicators. According to the network readiness index, Serbia ranked 55 out of 131 countries in 2022 (Portulans Institute, 2022b, p. 1).

Graph 1 presents a comparison of the network readiness index values of Serbia and selected countries of the European Union for 2022.

**Graph 1.** Comparison of the network readiness index of Serbia and EU countries

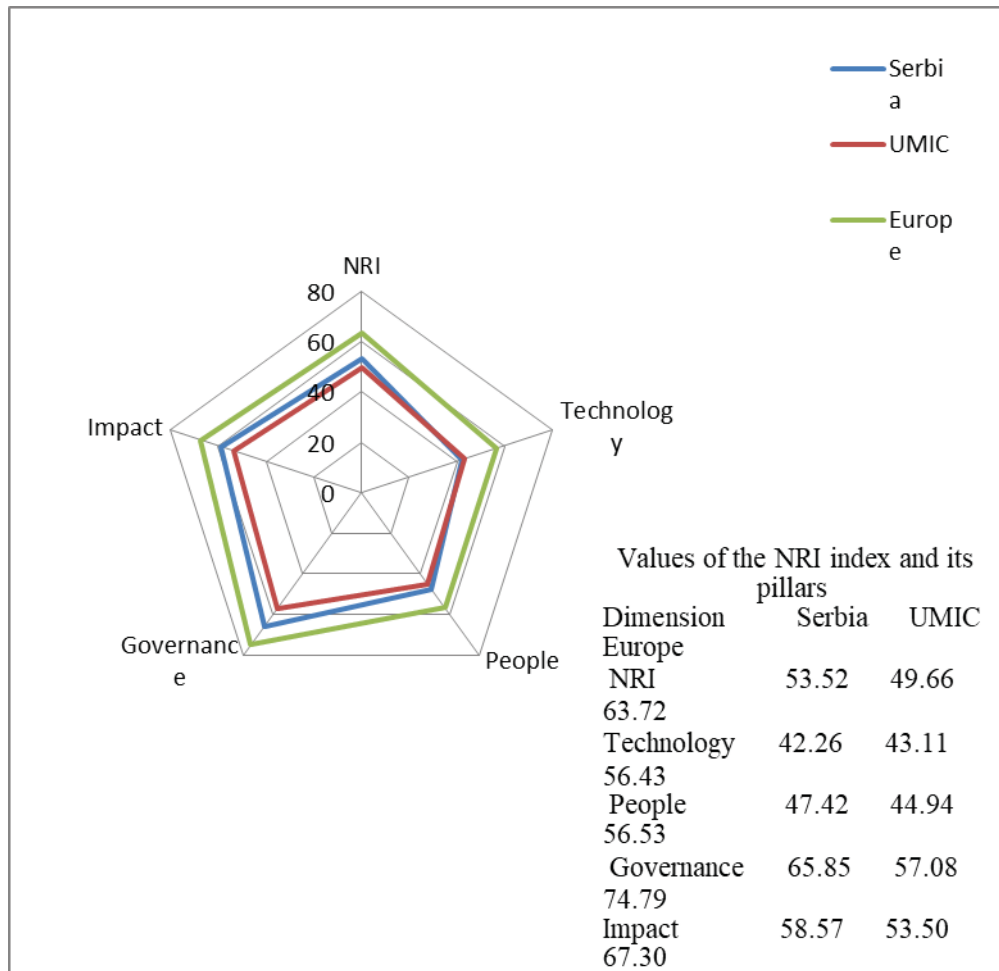


Source: Portulans Institute, 2022a, p. 32.

The research shows that Serbia lags behind the average of the European Union in the process of digital transformation (graph 1). Serbia achieved a network readiness index value of 53.52 points in 2022, and the European Union's average was 66.49.

The next Graph 2 presents a comparison of the values of the network readiness index and its four pillars (technology, people, governance, and impact) in Serbia, upper middle-income countries (UMIC), and the geographical region of Europe.

**Graph 2.** The performance of Serbia in relation to the region of Europe and upper middle-income countries in 2022



*Legend:* NRI - Network Readiness Index, UMIC - Upper Middle Income Countries

*Source:* Portulans Institute, 2022b, p. 3.

According to the network readiness index, Serbia (53.52) lags behind the region of Europe (63.72), and has an advantage over the group of upper middle-income countries (49.66). Compared to the region of Europe, Serbia lags behind in all four pillars of NRI: technology, people, governance, and impact. Compared to UMIC, Serbia has an advantage in three of the four pillars, with the exception of the technology pillar, where it lags behind.

Table 1 shows the index values and the ranking of the country for sub-pillars and indicators from the network readiness index of Serbia for 2022.

**Table 1.** Indicators from the network readiness index of Serbia

Sub-pillars and indicators	Index value (0-100)	Country rank (1-131)
Sub-pillar "Access":	65.19	65
- Population covered by a 3G mobile network (%)	99.82	51
- FTTH/building Internet subscriptions (% GDP)	25.42	62
- International Internet bandwidth (MB/s)	74.42	45
Sub-pillar "Future technologies":	19.12	113
- Adoption of emerging technologies (1-7)	40.36	80
- Investment in emerging technologies (1-7)	31.25	92
- Computer software spending (% GDP)	3.58	105
Sub-pillar "Trust":	54.98	53
- Online access to financial accounts (%)	18.74	81
- Internet shopping (%)	38.61	48
Sub-pillar "Regulation":	70.70	48
- ICT regulatory environment (0-2)	94.71	11
- Regulation of emerging technologies (1-7)	33.68	80
- E-commerce legislation (0-4)	100.0	1
Sub-pillar "Inclusion":	71.87	50
- Socioeconomic gap in use of digital payments (%)	88.33	40
	60.97	81



- Gender gap in Internet use	62.00	68
- Rural gap in use of digital payments (%)		
Sub-pillar "Individuals":	51.45	53
- ICT skills in the education system (1-7)	51.18	58
- Tertiary enrollment (%)	45.24	37
Sub-pillar "Businesses":	42.84	65
- R&D financed by business enterprises (% total R&D )	2.55	90
- R&D performed by business enterprises (% GDP)	9.19	46
Sub-pillar "Governments":	47.96	50
- Government online services (0-1)	78.79	42
- Government promotion of investment in emerging tech	38.59	61
- R&D expenditure by governments and H.E. (% GDP)	50.94	28

Source: Portulans Institute, 2022b, p. 5-6.

According to Table 1, Serbia has good results in the sub-pillars of regulation and governments and poor results in the sub-pillars of access, businesses, and future technologies. In the case of indicators, there are good results in terms of e-commerce legislation, the ICT regulatory environment, R&D expenditure by the government and higher education, tertiary enrollment, and the socioeconomic gap. Poor results are expressed in the cases of the gender gap in Internet use, R&D financed by business enterprises, and computer software spending.

The detailed progress of the digital transformation of the Serbian economy and society can be seen through an assessment of the availability and use of digital technology by the population, enterprises, and the state (public administration), as well as an assessment of the impact of the digital transformation on the economy, labor market and employment.

Table 2 shows the indicators of the digital transformation of Serbia in the population, business, and state sectors for the period 2018-2022.

**Table 2.** Digital transformation progress in Serbia

Proceedings Book from Second International Scientific Conference  
 ”Challenges of Digitalization in the Business World” Belgrade

	2018	2019	2020	2021	2022
<b>Population:</b>					
- Households with computers (%)	72.1	73.1	74.3	76.7	77.0
- Computer use (last three months) (%)	70.7	71.9	72.4	74.8	75.9
- Internet access (%)	72.9	80.1	81.0	81.5	83.2
- Internet use (last three months) (%)	73.4	77.4	78.4	81.2	83.5
- Internet access (%)	72.5	79.6	80.8	81.4	100.0
- Internet use (last three months) (%)	-	-	90.5	91.7	90.9
- Broadband internet connection (%)	67.5	71.1	71.9	73.3	74.4
- Fixed broadband connection (%)	30.9	34.2	36.1	42.3	47.8
- Mobile broadband connection (%)					
- E-commerce, shopping (%)					
<b>Economy:</b>					
- ICT sector, % GDP	4.5	4.9	5.2	-	-
- Import of ICT services, % total trade	1.8	2.1	2.2	2.4	2.2
- Export of ICT services, % total trade	4.0	4.3	4.9	5.5	5.9
<b>Business (enterprises) :</b>					
- Firms with computers (%)	99.3	100.0	100.0	100.0	100.0
- Internet access (%)	99.8	99.8	100.0	100.0	100.0
- Broadband internet connection (%)	98.8	97.1	98.4	100.0	100.0
- Internet speed greater than 100 MB/s (%)	7.1	15.1	21.7	34.5	46.4
- Firms with websites (%)	82.6	83.6	84.4	84.5	84.9
- E-commerce, sales (%)	27.5	27.9	27.1	28.0	-
- Firms with ICT professionals (%)	-	-	19.3	-	24.7
<b>Labor market:</b>					
- Employees in the ICT sector, % business	4.0	4.2	4.4	4.5	4.6
	2.4	2.6	2.8	3.3	3.4

- Employed ICT professionals, % total					
The state: - E-government users (%)	26.4	26.8	26.9	31.2	-

*Source:* Republički zavod za statistiku, 2022, p. 11-12, 14, 24, 68, and 71-72; Republički zavod za statistiku, 2020, p. 15, and 78-79; Republički zavod za statistiku, 2022a, p. 380-381; UNCTAD: Data; WIPO; Eurostat: Database.

In Serbia, the percentage of households with a computer was 77.0% in 2022, and the share of individuals aged 16 to 74 who used a computer in the last three months was 75.9%. In 2022, the percentage of households with Internet access was 83.2% in Serbia and 92.4% in the European Union (Eurostat: Database). In 2022, the share of individuals aged 16 to 74 in Serbia who used the Internet in the last three months was 83.5%. In 2022, a computer was never used by 17.3% of individuals and the Internet by 10.5%. Many citizens in Serbia do not have the Internet or are computer illiterate, so they are not able to take advantage of ICT. This is especially true for people with disabilities, the Roma population, and the rural population (Đorđević, 2020, p. 86). The basis for the development of the digital economy and society is open, accessible, and high-quality Internet access. All households in Serbia that have an Internet connection have a broadband Internet connection. In 2022, the share of households with a fixed broadband internet connection in Serbia was 90.9%. The network via fiber-optic cables was used by less than 15% of users. In 2022, the share of households with a mobile broadband internet connection in Serbia was 74.4%. The 4G mobile network covered more than 90% of the population. The percentage of Internet users in Serbia who bought or ordered online in the last three months was 47.8% in 2022 (European Commission, 2022, p. 29 and 42; Republički zavod za statistiku, 2022, p. 11-15, and 20).

The ICT sector represents a central part of the digital economy. The share of the ICT sector in Serbia's GDP was 5.2% in 2020 (Eurostat: Database). Outsourcing and assembly operations dominate the structure of the ICT sector. The share of ICT services in total foreign trade was 7.9% in 2021, and the share of ICT goods was 1.66% (UNCTAD: Data). Services dominate the ICT export structure of Serbia. The export of ICT services recorded growth from 1336 million dollars in 2018 to 2820 million dollars in 2022 (World Bank: Data).

Electronic commerce in Serbia is not sufficiently developed. In 2022, the value of sales through electronic commerce in the total turnover was 5.6% in Serbia and 21.8% in the European Union (Eurostat: Database). The reason for the weak e-commerce turnover in Serbia is the lack of information among consumers about the benefits of e-commerce, digital illiteracy, weak legal consumer protection, and people's distrust of digital tools and services.

The business sector in Serbia made progress in the use of ICT from 2018 to 2022. In 2022, every company had a computer and an internet connection. The share of companies with a fixed broadband internet connection was 100%. The percentage of companies with an Internet speed of 30 to 100 MB/s was 40.6%, and with a speed of more than 100 MB/s, it was 46.4%. A large number of companies do business electronically, which means not only electronic buying and selling but also the organization of business in a network environment. In 2022, the share of companies with a website was 84.9%, and the share of companies that hold online meetings was 41.0%. The share of companies that sold products and services over the Internet was 28.0% in 2021. The share of companies that employed ICT professionals was 24.7% in 2022 (Republički zavod za statistiku, 2022, p. 64, 68-69, 71-72, 76, and 78).

Numerous domestic companies are implementing digital technologies in the areas of their work and activities. The use of digital technologies such as cloud technology and the Internet of Things is becoming increasingly important over time. The share of companies in Serbia that used cloud technology was 28.9% in 2021, the Internet of Things was 19.6%, and artificial intelligence was 0.2% (Republički zavod za statistiku, 2021, p. 81, 117, and 122-125). In general, the problem is small and medium-sized enterprises that are poorly prepared to use the advantages of digital technologies and to engage in the digital economy.

Digital transformation has a significant impact on employment and the labor market in Serbia. The percentage of the workforce involved in the ICT sector in relation to the total business sector was 4.6% in 2022 (UNCTAD: Data). The percentage of ICT professionals in total employment increased from 2.4% in 2018 to 3.4% in 2022 (Eurostat: Database).

Serbia is facing the problem of an insufficient number of ICT professionals. The supply of ICT professionals on the labor market is less than the demand for them (Pitić, 2018, p. 113). Education does not follow the development and needs of the ICT sector fast enough. The deficit of digital skills in Serbia is high. Data on computer literacy in Serbia for 2022 show that 34.2% of

persons aged 15 and over are computer literate, 14.8% of persons are partially computer literate, and 51.0% of persons are computer illiterate (Republički zavod za statistiku, 2022a, p. 43). Underdeveloped digital skills weaken the prospects for future economic growth, increase the digital divide, and increase the risk of digital exclusion. The weaknesses of Serbia are the backwardness of certain educational programs and insufficient state investment in higher education (Đorđević, 2020, p. 86). Expenditure for education was 3.6% of Serbia's GDP in 2021 and 4.8% of the European Union's GDP (World Bank: Data).

Serbia invests little in IT infrastructure, human resources, and the development of new technologies. The funds allocated by domestic companies for information technologies amounted to 0.5% of company revenue in 2021, and the world average was 4.0% of company revenue (NALED, 2021, p. 24). Software spending in Serbia was 0.0% of GDP. The funds allocated for the development of digital technologies in Serbia are insufficient. The total investment in research and development was 1.0% of the GDP of Serbia in 2021 and 2.27% of the GDP of the European Union (WIPO; World Bank: Data).

Serbia made progress in the introduction and implementation of e-government from 2018 to 2022. As a part of e-government, there are numerous services related to documents and certificates, family, education, health, business, etc. However, the level of development of e-services is lower than expected. In 2021, the percentage of individuals using e-government services was 31.2% in Serbia and 47.4% in the European Union (Eurostat: Database). The reasons for less use of public e-services are lack of knowledge about the offer of e-services, low digital literacy, complexity of procedures, and lack of trust.

### **3. RECOMMENDATIONS FOR DIGITAL TRANSFORMATION IMPROVEMENT**

The digital transformation of Serbia's economy and society has accelerated in the last five years. With the spread of digital technologies, there have been numerous changes and improvements in the spheres of the population, companies, and the state. However, the results of digital transformation in Serbia are unsatisfactory. The transformation of Serbia's economy is shallow and in its initial phase. This imposes the need to guide and speed up this process.

The progress of the digital transformation of Serbia's economy requires the following:

- determination of priority areas of digital economy development,
- expansion and improvement of digital infrastructure,
- strengthening the readiness to use technologies and inclusion,
- promotion of digital transformation in business,
- development of digital skills and the improvement of human capital,
- encouraging research and development of digital technologies,
- development and improvement of digital public services,
- establishment of a suitable legislative framework.

Serbia must focus on the development of the ICT sector in areas of high added value, such as software development and the development of its own products. Support is needed for the transition from outsourcing and assembly to designing and manufacturing products based on new technologies (Dung, Tri, & Minh, 2021, p. 902). Priority should be given to the following technologies: big data and business analytics, cloud computing, the Internet of Things, artificial intelligence, and blockchain (Službeni glasnik, 2020, p. 119 and 121). This further implies the formulation of specific development plans for selected ICT sectors.

The digital economy and society cannot be built without the existence of high-speed broadband internet throughout the territory of the Republic of Serbia. The growth of broadband internet coverage is closely related to GDP growth (Službeni glasnik, 2018, p. 12-13). Fast, reliable, and cheap Internet is a prerequisite for the development of the digital market and e-commerce. Serbia has the opportunity to further accelerate the development of its economy by increasing broadband internet coverage, speed, and bandwidth. Improvement is needed in terms of strengthening and expanding the fixed broadband internet network, primarily the network via fiber-optic cables. At the same time, it is necessary to improve and expand the 4G mobile network and introduce and develop the 5G mobile network.

The state should encourage digital transformation equally at the national, regional, and municipal levels in the areas of the population, business, and public sector. Encouraging and empowering people and businesses to use digital technologies implies investment in ICT infrastructure and human capital. Inclusion in the digital world requires greater Internet availability, reducing the cost of using the Internet, subsidizing vulnerable groups to

purchase devices, providing digital skills training to users to improve their capabilities, etc.

The support of digital transformation in business is needed in various industries and sectors of the traditional economy (agriculture, tourism, construction, etc.). The challenge is the integration of small and medium-sized enterprises into the digital economy. Furthermore, in addition to the increase in the number of companies using basic digital technologies, it is also necessary to increase the number of those using advanced technologies such as cloud computing, the Internet of Things, and artificial intelligence. It is also necessary to create a stimulating business environment to encourage and help startups create and apply digital technologies in order to create new products, services, or solutions.

Digital transformation leads to the need to master new skills. The types of digital skills needed today are different than those needed just five years ago (Službeni glasnik, 2020, p. 87). Many services are only available through new digital technologies, so acquiring new skills is essential to using them. Digital skills are important for accessing the labor market. Greater inclusion of citizens and businesses in the digital economy requires the spread of digital skills. It is therefore necessary to strengthen the role of ICT in the education and training system. It is important to raise the awareness of citizens about the need to adopt digital skills. Improvement is needed in the form of increasing the number of ICT professionals and increasing the general population's coverage of basic digital skills.

Encouraging research and development of digital technologies implies greater state investment in scientific and research infrastructure, tax incentives to companies for the development and implementation of new technologies, easier access to finance, promotion of cooperation between private businesses, universities, and institutes, investment in education, strengthening international cooperation, better use of existing research capacities, etc.

Digital public services offer numerous advantages for companies and individuals, primarily greater efficiency and lower costs. Investments are needed in e-government, e-health, e-justice, e-education, and the digitalization of transport and energy systems (Službeni glasnik, 2021, p. 37-38). It is necessary to make public e-services more accessible to the population and the business sector, to inform people about the services, to ensure legal security for users, and to integrate the aforementioned public e-services systems.

The regulatory framework for the application of digital technologies needs to be improved. Defining digital ownership and digital security is of particular importance for the further development of the digital economy. Increasing the digital security of citizens and businesses would encourage the use of ICT, e-commerce, e-banking, and other e-services. For this purpose, it is necessary to raise the awareness of the population and businessmen about the risks and methods of protection in the digital world. Furthermore, the legal regulation of data collection, storage, and processing is very important. Also, improvements in regulations regarding the development and use of new digital technologies are needed.

## **CONCLUSION**

The process of digital transformation in Serbia has intensified in the last five years. Digital technologies are changing the economy and society. The ICT sector recorded an increase in its share of GDP, foreign trade, and employment. Citizens, private companies, and the public sector are increasingly conducting business via the Internet. The share of users in e-commerce and e-government is growing. Digital technologies such as cloud computing and the Internet of Things are starting to be used more and more by companies. However, despite all this, the level of digital transformation in Serbia is unsatisfactory, especially compared to the countries of the European Union. Looking at the network readiness index and its pillars, it can be seen that Serbia lags behind the region of Europe by more than 9 points. The reasons for Serbia's lagging behind are insufficient investment in ICT infrastructure, education, and training, as well as research and development. Shortcomings in terms of ICT infrastructure come from the unfavorable structure of broadband internet connections. The key problems are the poorly developed network via fiber-optic cables and the absence of a 5G mobile network. The disadvantage is the low speed and unreliability of the Internet. Then, a significant share of the population does not have a computer or the Internet, which causes digital exclusion. There are also problems in the labor market in terms of the number of ICT professionals, which is lower than required. All this affects the weaker dynamics of Serbia's economic growth and the growth of sectors related to digital technologies. The weaknesses are insufficient investment in human capital and the poor structure of education programs. The low digital literacy of a not-so-small part of the population of Serbia makes it impossible for them to participate in the digital economy. Furthermore, problems exist in terms of businesses that are not ready to develop and use digital technologies. The situation is



problematic with regard to small and medium-sized enterprises that do not have the ability to take advantage of digital technologies. Many companies have a website, but at the same time, few of them offer online sales services. That, together with shortcomings on the demand side, conditions the weak turnover of e-commerce. Politics and legislation in the digital sphere are somewhat of a bright spot, but only in terms of enacted regulations, documents, and strategies. The fact is that legal protection is generally ineffective. People's trust in digital technology is low, so the use of technology is absent even though there is a possibility.

Dynamizing and expanding the digital transformation of Serbia's economy requires overcoming the aforementioned problems and shortcomings. Support is needed with regard to the development of the ICT sector, the spread of digital technologies to all sectors of the economy, the improvement of ICT infrastructure, the transformation of business, the integration of small and medium-sized enterprises into the digital economy, strengthening digital skills, greater digital inclusion, strengthening scientific and research potential, the improvement of public e-services, increasing digital security, and legal protection.

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## ДИГИТАЛНА ТРАНСФОРМАЦИЈА И ЕКОНОМИЈА СРБИЈЕ

**Апстракт:** *Дигитална трансформација радикално мења основне претпоставке функционисања савременог друштва и економије. Интензиван раст обима дигиталних технологија у последњој деценији довео је до структурних промена у економским активностима бројних земаља широм света. Дигиталне технологије омогућају предузећима да стекну конкурентску предност, побољшају своје производе и услуге, и да прошире своја тржишта. Постало је јако битно за државе широм света да планирају и успешно воде дигиталну трансформацију како би одржале конкурентност својих привреда и унапредиле животни стандард становништва. Процес дигиталне трансформације доводи до бројних проблема и изазова у свету и у Србији, а то захтева истраживање и одговоре. Аутори истражују дигиталну трансформацију економије Републике Србије. Рад разматра и анализира изазове дигиталне трансформације са којим се суочава домаћа привреда. Циљ рада је да утврди стање у којем се налази домаћа дигитална економија, и да идентификује проблеме који се налазе на путу успешне дигиталне трансформације Србије. Посебно се сагледава позиција домаће дигиталне економије у односу на регион Европе. Аутори сугеришу главне правце дигиталне трансформације економије Србије.*

**Кључне речи:** *дигитална трансформација, дигитална економија, дигитализација, информационо-комуникационе технологије, Србија.*

## CHALLENGES OF DIGITALIZATION – NEW MEDIA AND ACTIVE PUBLIC: THE ADVANTAGES AND DISADVANTAGES OF THEIR GROWING CONNECTION AND INTERDEPENDENCE

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**Abstract:** *This paper will address the different challenges that media is facing in a digital environment today. New media encompasses digital channels of communication like the Internet and social media platforms. While new media offers numerous advantages and opportunities, it also deals with a variety of problems and uncertainties in the modern digital sphere.*

*Individuals are increasingly turning to new media as their primary source of news, simultaneously becoming new sources of information themselves. This dynamic enables information to be disseminated at an unprecedented pace. This active audience represents a fresh type of public and consumer; they possess a clear understanding of the information they seek and where to locate it. They will customize their preferences on their respective new media accounts, ensuring they receive news tailored to their interests.*

*This implies that both media outlets and consumers will need to find a way to: a) deal with the overuse of digital platforms; b) address the issues surrounding privacy and confidence; and c) recognize fake news and misinformation. The process of digitalization is amplifying the number of information sources and giving rise to a wave of citizen journalism. This brings disparity in the types of news that will capture the audience's attention. Additionally, the public plays a more active role and has influenced many aspects of the media business.*

*The influence of new media permeates every aspect of how people consume news and shape their preferences, both in their professional and personal lives. This*

*relationship between the public and media has unlocked new ways for businesses and organizations to connect and interact with their audiences.*

**Key words:** *active audience, digitalization, interdependence, new media.*

## INTRODUCTION

The process of digitalization has impacted every global company, regardless of their industry or involvement in media. Digitalization will lead companies to embrace a fitting strategy and cultivate the necessary competencies in this new digitalized landscape. They will have to change interactions with their client, management processes, and overall efficiency. It will extend to improvements in quality, speed, and relevance of information procurement. These transformations will also renew procedures, which will be comprehended at a higher level due to the diminishing technological constraints. Information is now generated in diverse formats at a rapidly accelerating pace across various media, making it increasingly challenging to keep up with the content without the aid of information technology.

In this changed business environment, new media appeared and the consequence was occurrence of interactive communication between many people. It takes place in real-time but also in a time span that the audience chooses. Broadcasting can be done in a wide or narrow range, including the most diverse purposes and characteristics of communication practice (Kastels, 2014: 81,82).

The term „New Media“ refers to the wide range of digital technologies used for producing, disseminating, and consuming media content (Scott & Jacka, 2011). It encompasses diverse forms like social media, platforms, podcasts, websites, blogs, and streaming services. Additionally, new media has enabled fresh methods of communication and cooperation, such as social networking and online communities. It enabled people to connect across distances, share and exchange ideas and information, and build strong networks (IAP, 2010).

### 1. NEW MEDIA: CHARACTERISTICS AND PREFERENCES

New media were created by merging computing and media technologies, including graphic and textual content, images, sounds and spaces processed by computer technology. This kind of media is interactive and hypermedial,

accessible and personalized. Their functioning rests on five basic principles (Manović, 2015: 61-97):

- a) *Numerical representation* - almost all aspects of new media can be formally described and processed by algorithms. Content has a numerical form and is created through conversion and digitization - measuring and giving quantifications in binary systems;
- b) *Modularity* - all media elements are presented as discrete segments (pixels, characters) that can be viewed independently with their characteristics or in a group as a whole;
- c) *Automation* - the automation of creation process and access to variety information;
- d) *Variability includes various aspects*: 1) the media can, at the request of the user or in advance, produce objects with contents of different shapes, resolutions and characteristics; 2) content and interface levels can be separated; 3) the computer program can use the data to automatically adjust the composition of the media or to create the elements themselves; 4) interactivity is based on the existence of options, 5) elements are distributed throughout the network - hypermediality; 6) periodic updating, 7) scalability - the same media item is produced in different sizes or details - creating different versions of the same item that differ from each other;
- e) *Cultural transcoding* - cultural categories and concepts are being replaced by new meaning or derived from computational ontology, epistemology and pragma.

In today's modern society, new media is very present. Individuals engage with content in diverse formats, ranging from social media updates to extensive podcasts and streaming TV. As digital technologies progress, we can expect the emergence of media formats, further expanding the ways in which audience generate, absorb, and interact with content. The most significant features of new media are (Milivojević, 2017):

- a) *Convergence* - the possibility of media being translatable from one to another. Technological convergence has enabled the emergence of a new type of digital signal. All information is encoded and transferable across all platforms or all internet-based media;
- b) *Simultaneity* - person can simultaneously formulate and share messages in a many-to-many correlation and do it simultaneously while the events are unfolding;
- c) *Mobility* - mobile access to content and significantly changed connections between the subjects of communication;

d) *Interactivity* - mass scale, but individual use of a mass product.

The emergence of social media platforms like Twitter, Facebook, and YouTube in the 2000s brought shift in the media landscape. This social media empowered individuals to share information and connect on a much larger scale. The expansion of mobile devices and the availability of high-speed internet allowed people to access and consume media anytime and anywhere (Milivojević, 2017). The appearance of new media has led to a focus on the audience, which has evolved from being recipients of information to active participants in the communication process. In this interactive realm, the audience's role becomes even more crucial. They now assert their preferences for specific information, update their profiles on social media and new media to align with their content preferences, and they are willing to pay to avoid promotion. This audience encounters many information sources, placing larger pressure on media outlets to work harder to capture and retain their attention and loyalty.

## **2. ACTIVE PUBLIC AS AN ACTIVE CONSUMER**

In recent years, the role of new media in the consumption of news has gained importance. According to international level comparative data audience are increasingly using social networks as their primary or secondary source of news (Newman et al., 2016). Datareportal April 2023 global overview (Smart Insight, 2023) shows how serious and important this is. This research shows that more than half of the world uses social media (60%) - 4.80 billion people, and they spent 2h 24m daily on them. Users mostly spent their time on Facebook (2,963 billion users), YouTube (2,527 billion users), WhatsApp and Instagram (2000 billion users) etc. With social networks audience can express their views on public issues and adopt an active attitude that went beyond the traditional passive audience role (Masip, et al, 2019).

Social networks and all other new media are influencing people to becomes an active participant in communication process. Such frequent communication means that the public is ready to collaborate, participate, and then share and comment on content in online sphere. Users connect with other users and create new content. The audience is familiar with the online places where they can find information and tend to personalize those places, so they become an active audience (Bubanja, 2017:135). Kotler (Kotler et al., 2017) claims that this new type of public does not trust ordinary media and advertising. They give away their trust to their family, friends, Facebook friends and Instagram followers. The member of this active audience shares:

experiences, preferences, gives ratings and comments, but also finds information and inspiration. It is a new zone, the individual is informed, but also feels free.

In the contemporary media landscape, media plays a crucial role in everyday life. Audiences are increasingly engaged and interactive, and the conventional distinction between the public and the audience becomes indistinct. This distinction also applies to the separation of public and private spheres (Papacharissi, 2010). The term „active audiences“ highlights the transformed nature of new media environment, where media is an indispensable aspect of everyday life, and audiences are more interconnected (Bruns & Highfield, 2016). Audiences are now perceived not only as active interpreters of journalistic content, but also as contributors to the creation, dissemination of public discourse in online spaces (Masip et al., 2015).

An active audience can contribute to the work of new media in various ways (Marwick and Boyd, 2011):

- a) *Very low*: participating in polls and rating content, which enables little control, requires minimal effort, and is invited post hoc;
- b) *Low*: commenting and participating in discussion forums, but enabling more control over the published content, in the sense that it will either be published wholesale or not;
- c) *Medium*: submitting collaborative content and multimedia at the request of media organizations during the planning stage or during the ongoing process, which requires some effort and enables limited control over the content that is going to be published;
- d) *High*: blogging and submitting full articles which require the most effort and allow for the most control over content as planned and created before publication.
- e) *Sharing*: „sharing possibilities“ through social network sites as a unique category as sharing contributes and shapes, what Singer (Singer et al., 2011) has named, secondary gatekeeping. New media have been theorized as networked public spaces where users can share, discuss, and contribute to news making (Marwick and Boyd, 2011).

Each of these categories is significant and enables the new media to become not only a place where an increasing number of people are informed, but also a place for the audience to meet, communicate, and exchange opinions and attitudes.

Before, the audience activity was limited by the private sphere in which it took place. But in virtual communication that activity comes out into the



public sphere, often as a response to the contents found in the online classic mass media producers. Activity as a reaction becomes action, and private source-producers of news gain attention, topicality and credibility that was earlier in the domain of organized and institutionalized communication centres (Kleut, 2010: 52). This means two things. The first, active audiences have a strong desire to interact and connect, and new media allow them to do so in more creative ways. The media is beginning to align with the audience, and its activity and loyalty. This makes the journalists and editors work easier and shows them where to focus their attention and resources. After that the active audience will give a feedback on selected information, comments and requests.

The second is a practice that is called "citizen journalism". Citizen journalism can be seen as the last stage of blurring line between active journalists and passive audiences or as the last stage of activation - in which citizens become journalists. According to the narrow definition, citizen journalism implies an online content offer, mostly news, that are not available through traditional media or via the Internet. It represents an alternative content. However, almost every element of this narrow definition is still open to include non-Internet practices, such as online comments on mainstream content, modification of other media content, metajournalistic practices of systematizing mainstream sources, etc. (Goode 2009: 2–5 in Kleut, 2010:52).

### **3. ACTIVE AUDIENCE AND NEW MEDIA - THE CONSEQUENCES FOR THE WORK OF THE MEDIA**

The popularity of new media has led to an increasing interdependence of the audience and new media. The stronger bond brings numerous advantages and disadvantages.

#### **a) Informing as a 24/7 process**

With the emergence of media in the online sphere and the development of new media, informing has become a 24/7 process. The media cannot afford not to cover events of public interest or to present them late because competitors will gain more popularity and a bigger number of clicks. Also, the active audience in the service of citizen journalism will already be on their profiles on social media, blogs and channels to publish different views on a given event. This means that the process of gathering and publishing information has been significantly transformed (Čejko, 2019).

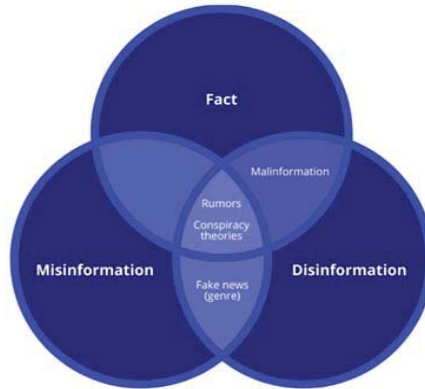
An excessive amount of information in online sphere opens up the possibility to present different content and current events from more angles and perspectives than before. On the other hand, this much information doesn't necessarily mean variety, accuracy, or quality of information. The active audience usually accesses only one segment of the given information, the one that is similar to their previous attitudes and preferences. Also, the new audience now believes that access to that information must and should be free. In authoritarian and less democratic societies there is greater pressure on the media to publish strategically framed information. Larger number of sources and media contents can assure that information which is not in line with the interests of political and economic structures, will not reach the audience.

#### **b) False information**

Because of accessible digital environment, media content consists of those stories whose accuracy is questionable. Although, this seems as an audience challenge, this is a major consequence of economic and political circumstances that the media are facing. The proliferation of misinformation and fake news has become a critical issue in new media. The rapid and widespread nature of digital communication has facilitated the dissemination of false information. Social media and other communication platforms serve as presentation tools for inaccurate content. The algorithms in these platforms tend to amplify and prioritize content that will more likely gain engagement. Malicious actors with various motives (from political influence to financial gain) are responsible for the dissemination of misinformation and fake news. These individuals use bots, fake accounts, and other tools to amplify false information and manipulate public sentiment (Chakrabarti et al., 2018).

Types of false news and their differences and similarities are presented in **Picture 1**. Misinformation is misleading information created or disseminated without manipulative or malicious intent (Adjin-Tettey, 2022). Lucinda Austin (Austin et al., 2020) says that misinformation is „false information shared without the intention of harm." On the other hand, the dissemination of deliberately false information (when supplied by a power agent) influences the policies or opinions of those who receive it. More recent definitions tend to highlight how it's not just government agents that produce and spread disinformation, but corporations and individuals too. Legucka (2022) adds that the goals of disinformation are: a) deception, b) profit gain, and c) an intent to harm.

**Picture 1.** Types of false news



Source: <https://insights.taylorandfrancis.com/social-justice/misinformation-vs-disinformation>

The most common false information is „fake news“. There are two dimensions of „fake news“:

- a) *Fake news as a genre* (disinformation or misinformation disguised as journalistic news): When misinformation and disinformation are packaged in a news format, they can be described as „fake news“. Those are news or articles that are intentionally and verifiably false, and could mislead readers (Adjin-Tettey, 2022);
- b) *Fake news as a label* (use of the term as a tool to attack or delegitimize news media): allows political actors to discredit news media, and portray it „as institutions that purposely spread disinformation to deceive“. Political actors can criticize news in the media, but it now happens more often, following the introduction of the „fake news“ label (Egelhofer & Lecheler, 2019).

The dissemination of false information has the potential to undermine trust in media, science, and other trustworthy sources. This has far-reaching implications for public health, environmental policy, and other critical domains where accurate information is paramount. Because of these consequences, it is important to foster media literacy and critical thinking skills to confront these challenges. Audience should be empowered to recognize and evaluate false information effectively (Agrawal, 2016). New media platforms should be accountable for their role in propagating false information. State and media systems should develop tools and strategies against the spread of misinformation, including fact-checking, transparent

algorithms, etc. The promotion of responsible journalism and compliance with ethical standards within the media sphere is essential (Caplan, et al., 2018).

### **c) Citizen journalism and gatwatching**

The active audience began seeking alternative sources of news and well-informed opinions. Some of them even started generating and sharing their own reports, commentaries, debates, and discussions on current events, particularly in the online sphere. These platforms depart from the traditional model of journalistic operations, where journalists and editors hold a pivotal role in curating and selecting the news reports presented to the audience (Bruns & Burgess, 2011). In this way, the traditional media's gatekeeping function has transformed. It has been evolving into a gatwatching experience. This means that journalists now have a responsibility to do both: to report and to provide commentary on the news. They no longer operate from a position of authority based on the brand and imprint, ownership, and control of the news flow. Instead, they use collective intelligence and expertise to break through the news flow and consider meaningful topics relevant to the community (Bruns, 2005).

The way media are used is constantly changing. There are many innovations in the news world, and the media are becoming increasingly interactive and fragmented. The way of using traditional media has also changed. Users who are also consumers of their content can access it on the Internet and digital media, and even shape the content itself. With the help of new media, the audience gets new, mediatized experiences, which gives them a wider choice, when it comes to content consumption. The audience rising influence on the media and is becoming an assistant and accomplice in content creation. All these changes affect and change both - the world of the media and the world of the audience (Čejko, 2019: 232, 233).

## **4. ACTIVE AUDIENCE AND NEW MEDIA - THE CONSEQUENCES ON THE AUDIENCE**

It is difficult to separate the advantages and disadvantages of interdependence between new media and active audiences because of the strength of this connection. All changes are relate to the media and media progress in online sphere, on the one hand, and on the other hand, to the audience and its demands, wishes and needs.

### **a) Fake news and disinformation**

In the previous section, it is stressed that fake news and disinformation can have a significant influence on media consumers, as well as on the media. According to Marwick and Lewis (2017), media manipulation can lead to a decline in trust towards mainstream media, and an increase in misinformation can contribute to further radicalization. Even when false information is exposed and corrected, it can still shape people's attitudes (Thorson, 2016). Rapp and Salovich (2018) argue that media consumers often rely on the inaccurate information they encounter to carry out subsequent tasks. This is detrimental to news consumers because making decisions and forming opinions based on misinformation can be severe.

Consumers of news content must distinguish fake and accurate news stories. Trusting every news source without critically evaluating the content and source can lead to misinformation, leaving individuals ill-equipped to make effective decisions (Adjin-Tettey, 2022). Therefore, being media and information literate is essential in ensuring that consumers of media content do not fall to deceptive information.

#### **b) Leaving information online as a privacy and security problem**

The online sphere has become a new place of residence and socialization of individuals. They build new identities in it and live different lives from those in the real world. Today, it has become important for individuals, but for companies, as well, to be present in online sphere because otherwise, it is as if it does not exist. Many users of the Internet and digital media create and share stories, photos, posts, comments, and generally send each other different types of information (Jenkins, 2006). This kind of participatory culture and economy is at the basis of new media. The audience, active as it is, leaves various types of data on websites, blogs, and networks and reveals a lot about themselves (Astor, 2017).

Audience members like this kind of presence and networking because it allows them to connect more easily with other consumers of similar content. Also, it is easier to establish communication and build a relationship. Individuals become more secure and open, which is a great advantage of this new kind of freedom, but, at the same time, the large amount of data that is left behind can be misused in various ways and carries a great risk. For this reason, in the new media, privacy and security stand out as significant apprehensions. The advancement of digital technologies relived the collection, retention, and distribution of personal information. There are many concerns and difficulties associated with privacy and security in new media: numerous new media platforms gather users' personal data,

encompassing passwords, browsing and search records, location particulars, and even biometric data (Dihamn, 2023:2). This data is often shared with third-party advertisers and other organizations, raising concerns about privacy and the potential for misuse.

In today's technological society, it is difficult to hide data. Numerous organizations, including the media, have been collecting and classifying information, data and comments left by individuals in the online sphere for years. In this way, a detailed profile of an individual can be created with all his peculiarities, interests, habits, behaviours, etc. Nowadays, it is much more difficult to find spaces where data is not collected, and aspects of the personality remain unknown or private (Čejko, 2019:110). In this way, different actors supervise the members of the audience, and the members of the audience themselves supervise each other. In addition, audience members consider this kind of presence in online spaces a necessity today, and the culture of continuous inclusion and connection is a mark of modern societies.

Manuel Castells (2009) characterizes today online (web 2.0) communication as mass self-communication. This is mass communication because it can potentially reach a global audience (posting a video on YouTube, a blog with RSS links to a number of web sources) and, at the same time, it is self-communication because the production of the message is self-generated. Potential receiver(s) is self-directed, and the retrieval of specific messages or content from the World Wide Web and electronic networks is selfselected (Castells, 2009: 55). This Web 2.0 surveillance is directed at large user groups who help to hegemonically produce and reproduce surveillance by providing user-generated (self-produced) content. We can therefore characterize web 2.0 surveillance as mass self-surveillance (Fuchs, 2011).

### **c) Addiction**

Over the last decade, many addictive behaviours have become a part of our lives, such as Internet addiction, excessive use of the Internet, microblogs, blogs or social networking sites.

Among the criteria for determining what addiction is: loss of control over the urge to use the Internet or to stay in the online sphere, psychological and social problems, and a feeling of anxiety and desire when not staying in the online sphere. As the search for information causes satisfaction of the audience's needs, it also brings a feeling of happiness. Audience activities related to new boundaries bring with them engagement and status achievement and carry approval of others (Kurtzberg & Gibbs, 2017).

Several factors contribute to addiction and overuse of new media. One is the constant availability and accessibility of these technologies, making it challenging to disengage from them. Another is their instant gratification, which can make them highly rewarding and reinforcing, leading to a desire to use them repeatedly (Dhiman, 2019). Additionally, social pressure, such as the fear of missing out can drive people to spend more time on social media and other platforms, even if it is not necessarily beneficial for them.

It is important to cultivate positive routines and techniques to mitigate the risk of becoming addicted or excessively reliant on new media. This can involve establishing boundaries for the amount of time spent on social media and similar platforms, scheduling regular breaks, participating in alternative activities like yoga, meditation, physical exercise, or pursuing hobbies, and seeking professional assistance if needed.

## CONCLUSION

With the digitization process, the media work and the process of informing have changed drastically. Today, it is expected from media to publish information in a round-the-clock cycle and non-stop. The media is in the process of convergence, and there are more and more media conglomerates. The structure of the media and journalism is constantly changing. The material is repeated and formed for the needs of new media and traditional media as well.

The relationship between new media and active audiences is becoming increasingly complicated and intense, and the bonds established over time become stronger. The active audience is not a new type of audience and is becoming super connected with the media. This type of audience has a new life on social media and new media profiles, and it has also become a content creator and a helper who selects information. The media now have a new role, doing more monitoring than gatekeeping.

With the new stages of Internet development and media formations, ways of presenting content are also changing. Media content has become more accessible, which enabled individuals with similar preferences to be connected. Users of new media access content, share it, comment on it, and then shape it in their ways and follow their interests. The user now has more control and can decide to consume only segments of the given content. This can, at the same time, prevent the audience from realizing a broader perspective of events. In this way, members of the active public remain

trapped in their micro-worlds and become insufficiently informed, educated, ect.

Today, various digital platforms and media give people access to previously imaginable communication resources and information. The development of new media enables the further progress of technology, media and communications in general. In line with that, social norms and behaviours are decreasing, as well as values, which means that there are changes at the cultural and social levels. No one knows what the future of the audience, media and technology holds, but it is important to ensure that the audience can face problems and challenges in the best possible way.

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## THE CHALLENGES IN ACHIEVING THE “DIGITAL SOVEREIGNTY” OF THE EUROPEAN UNION – THE NEED TO ENHANCE THE EUROPE’S CYBER POWER RESILIENCE

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**Abstract:** *Power depends upon context, and the rapid growth of cyber space is an important new context in world politics. Changes in the information ecosystem have always had an important impact on power, but the cyber domain is a new type of environment. Having this in mind, the paper will examine the challenges of the European Union’s support for a new policy approach designed to enhance Europe’s strategic autonomy in the digital field.*

*EU policymakers have started to design policies to enhance the bloc’s digital strategic autonomy. The EU is increasingly seen as a standard-setter in privacy and data protection and has already undertaken an important legislative effort in the field of cybersecurity and 5G network security. Furthermore, ensuring transparency and trust has become the hallmark of the EU approach to digital matters. Also, proposals have been made to push further initiatives at EU level to accelerate the digitalization process and to build a data framework for a trustworthy digital environment and adapt competition and regulation rules.*

*By using the analytical deductive method and a method of empirical analysis, the paper will examine the challenges in achieving a full technological autonomy of the European Union. This would require the Union to update and adapt a number of its current legal, regulatory and financial instruments, and to promote more actively European values and principles in areas such as data protection, cybersecurity and ethically designed artificial intelligence (AI). Building a secure pan-European data framework and adopting new standards and practices to provide trustworthy and controllable digital products and services would ensure a safer digital environment. Furthermore, in the competition and regulatory framework, a shift towards more*

*defensive and prudential mechanisms, including new rules to address foreign state ownership and large tech companies' distortive practices, would seem desirable to achieve more technological autonomy.*

**Keywords:** *cyber power; digital sovereignty; digital transformation; European Union.*

## INTRODUCTION

In recent years, the European Union (EU) has become a world leader in curbing the power of big tech companies, such as Google, Facebook and Amazon, to protect the interests of their end users. The EU has adopted new rules in the digital sphere which include strict data privacy rules, a number of antitrust investigations as well as proposed rules for areas such as artificial intelligence (AI). Before that, the European Commission fought against the dominant position of internet companies by launching litigation proceedings for infringing market competition rules. This, however, proved to be quite ineffective, as it reacted with some delay, while the litigation itself took a long time. With the new rules, the EU's approach has changed, so the EU is acting before certain irregularities are identified. In order to achieve digital sovereignty, the European Commission has planned to provide next-generation technologies by 2030, which would be able to process personal data of EU citizens in order to reduce potential abuses by third countries. The program named "Digital Compass" outlines a series of measures that should be achieved by the end of 2030 in order to achieve full digital sovereignty. European Commission data shows that as much as 90% of EU data is in the hands of U.S. companies, which greatly undermines the EU's autonomy in the modern information age. The Commission recognises that EU-based *cloud services* providers have only a small share of this market. The European Commission plans "an increasing share of data to be processed where data are generated".<sup>15</sup>

Digitalisation in the EU is progressing, but businesses are still lagging behind the advancement of digital technology. The 2022 Digitalisation Index shows that most EU Member States have made progress in digital transformation, but that the adoption of key digital technologies such as artificial intelligence and big data within the economy remains weak. Digital skills are another important area where greater progress needs to be made,

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<sup>15</sup> „EU želi digitalni suverenitet do 2030. godine”, Nova Ekonomija, Internet: <https://novaekonomija.rs/vesti-iz-sveta/eu-zeli-digitalni-suverenitet-do-2030-godine>, 17.10.2023.

and also to step up efforts to build connectivity infrastructure, especially 5G. In the EU, Finland, Denmark, the Netherlands and Sweden are the leading countries in digitalization, and Italy, Poland and Greece have also advanced in the last five years. Improvements are also needed in the digital skills of citizens because digital tools are today an integral part of everyday life in society. Only 54% of EU residents aged 16-74 have basic digital skills, and the EU Digital Decade aims to reach at least 80% by 2030. "We need to step up our efforts to ensure that the best digital solutions are available to every small and medium-sized enterprise, every business and industry in the EU and that they have access to a world-class digital connectivity infrastructure," said Thierry Breton, European Commissioner for the Internal Market.<sup>16</sup> This was stated when the European Commission wanted to accelerate the launch of important projects in several countries and to prepare legislative proposals setting out a robust governance framework in order to monitor progress – Digital Compass.<sup>17</sup>

The Commission's communication, "Digital Compass 2030: A European Path for a Digital Decade", sets out a vision for the European Union to successfully achieve the digital transition by 2030. The EU's ambition is to be digitally sovereign in an open and interconnected world and to implement digital policies that enable people and businesses to have an inclusive, sustainable and prosperous digital future. In its conclusions of 25 March 2021, the European Council underlined the importance of digital transformation for the EU's recovery, prosperity, security and competitiveness and for the benefit of society. The digital compass is a step towards mapping Europe's digital development for the next decade. To this end, the Council invited the Commission to make use of all available instruments in the field of industrial, trade and competition policy. In light of these ambitions and challenges, on 15 September 2021, by a decision of the European Parliament and of the Council, the Commission proposed the

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<sup>16</sup> Digitalizacija u EU napreduje ali preduzeća zaostaju sa digitalnom tehnologijom", DES, Internet: <https://dnevnievropskiservis.rs/8-eu-prioriteti/137-vesti/17617-digitalizacija-u-eu-napreduje-ali-preduzeća-zaostaju-sa-digitalnom-tehnologijom>, 28.9.2023

<sup>17</sup> European Commission, Communication From the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 2030 Digital Compass: the European way for the Digital Decade", COM(2021) 118 final, Brussels, 09.03.2021; "EU4Digital", Internet: <https://eufordigital.eu/library/2030-digital-compass-the-european-way-for-the-digital-decade/#:~:text=The%20Communication%2C%20published%20on%209,monitor%20progress%20%E2%80%93%20the%20Digital%20Compass,19.10.2023>.

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establishment of a Digital Policy Programme: 'The Path to a Digital Decade'.<sup>18</sup>

### **A BUMPY "PATH TO THE DIGITAL DECADE" – 2030 DIGITAL POLICY PROGRAMME AS AN INSTRUMENT OF LEVERAGING THE EU'S CYBER RESILIENCE**

The European Parliament and the Council of the EU have reached a political agreement on the 2030 Policy Agenda: "Towards a Digital Decade", with concrete objectives aimed at delivering on the EU's digital transformation. Consequently, the European Parliament, the Member States and the Commission have jointly set concrete objectives in four key areas: digital skills, infrastructure, including connectivity, digitalisation of businesses and digital public services, and in line with the Declaration on European Digital Rights and Principles.<sup>19</sup> The objectives and tasks are accompanied by a cyclical cooperation process, which is planned to start on 9 January 2023 and end by 2030. The Programme also creates a new framework for multi-country projects that will enable Member States to join forces on digital initiatives.<sup>20</sup> The 2030 Digital Decade Policy Agenda is designed to create an environment conducive to innovation and investment setting a clear path for the EU's digital transformation and for achieving digital goals based on measurable indicators. This Programme sets out the structure and stimulates cooperation between the European Parliament, the Council, the Commission and the Member States. In addition, the Programme is designed to foster consistency, comparability, transparency and completeness of monitoring and reporting by the Union.<sup>21</sup> Decision (EU) 2022/2481 establishes the Digital Decade Policy Programme 2030 and establishes a monitoring and cooperation mechanism within its framework. In adopting the Decision, the Treaty on the Functioning of the European Union was taken into account, in

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<sup>18</sup> „EU: Program politike 2030 ‘Put u digitalnu deceniju’”, The European Times, Internet: <https://www.europeantimes.news/bs/2022/05/Put-programa-politike-eu-2030-do-digitalne-decenije/>, 29.09.2023.

<sup>19</sup> “The Declaration on European Digital Rights and Principles, 26 January 2022”, European Commission, Internet: <https://digital-strategy.ec.europa.eu/en/library/declaration-european-digital-rights-and-principles>, 29.1.2023.

<sup>20</sup> “First cooperation and monitoring cycle to reach EU 2030 Digital Decade targets kicks off”, European Commission, Internet: <https://digital-strategy.ec.europa.eu/en/news/first-cooperation-and-monitoring-cycle-reach-eu-2030-digital-decade-targets-kicks/>, 09.01.2023.

<sup>21</sup> “Decision (EU) 2022/2481 of the European Parliament and of the Council of 14 December 2022 establishing the Digital Decade Policy Programme 2030”, Official Journal of the European Union L 323/4, 19.12.2022.

particular Article 173(3) thereof, the proposal of the European Commission and the opinion of the European Economic and Social Committee.<sup>22</sup> The decision was taken after the transmission of the draft legislative act to the national parliaments and after consultation with the Committee of the Regions acting in accordance with the ordinary EU legislative procedure. The overall objectives of the 2030 Digital Decade Policy Programme at the EU level include:

1. Promoting an inclusive, transparent and open, human-centered digital environment, based on fundamental rights, where secure and internally operational digital technologies and services respect and advance EU principles, rights and values and are accessible to all, everywhere in the EU;
2. Strengthening member states' collective resilience and bridging the digital divide, achieving gender and geographical balance by promoting ongoing opportunities for all individuals, developing basic and advanced digital skills and competences, including through vocational and professional training, and lifelong learning, and fostering the development of high-performance digital capacities within horizontal education and training systems;
3. Ensuring the EU's digital sovereignty in an open manner, in particular through secure and accessible digital capacities and infrastructures capable of effectively storing, transmitting and processing vast amounts of data enabling other technological developments, supporting the competitiveness and sustainability of EU industry and the economy, in particular SMEs and the resilience of EU value chains, as well as fostering start-up ecosystems and the smooth functioning of European digital innovation hubs;
4. Promoting the application and use of digital capabilities to reduce geographical digital divide and grant access to digital technologies and data under open, accessible and fair conditions, in order to achieve a high level of digital intensity and innovation in enterprises, in particular in new and small and medium-sized enterprises;
5. Developing a comprehensive and sustainable ecosystem of internally operating digital infrastructures, where high performance, cutting-edge technology, cloud, quantum computing, artificial intelligence, data management and network connectivity function in convergence, in order to

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<sup>22</sup> "Opinion of the European Economic and Social Committee on Proposal for a decision of the European Parliament and of the Council establishing the 2030 Policy Programme 'Path to the Digital Decade'", EESC, Official Journal of the European Union C 194, 12.05.2022.

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promote their acceptance by EU businesses and to create opportunities for growth and jobs through research, development and innovation, and ensuring that the EU has a competitive environment. secure and sustainable data cloud infrastructure, with high standards of security and privacy, and in accordance with EU data protection rules;

6. Promoting the EU's digital regulatory environment to support the ability of EU companies, especially SMEs, to compete fairly along global value chains;

7. Ensuring that online participation in democratic life is possible for all, and that public services, health and care services are also available in a reliable and safe online environment for all, in particular for disadvantaged groups, including people with disabilities, as well as in rural areas and remote areas, offering inclusive, efficient, internally operational and personalized services and tools with high standards of security and privacy;

8. Ensuring that digital infrastructure and technologies, including their supply chains, become more sustainable, resilient and efficient in terms of energy and resources, in order to minimise their negative impact on the environment and society, contribute to a sustainable circular and climate neutral economy and society in line with the European Green Deal, including promoting research and innovation contributing to this goal and developing methodologies for measuring energy efficiency; and the efficiency of the resources of the digital space;

9. Enabling fair and non-discriminatory conditions for beneficiaries during the eu-wide digital transformation by strengthening synergies between private and public investment and the use of EU and national funds, and by developing predictable regulatory and supportive approaches, which also include regional and local levels;

10. Ensuring that all policies and programmes relevant to the achievement of digital objectives are taken into account in a coordinated and coherent manner to fully contribute to Europe's green and digital transitions, while avoiding overlaps and minimising administrative burdens;

11. Improving resilience to cyberattacks, contributing to increasing risk awareness and knowledge of cybersecurity processes, and increasing the efforts of public and private organizations to achieve at least basic levels of cybersecurity.<sup>23</sup>

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<sup>23</sup> Decision (EU) 2022/2481, op.cit., Article 3.



The global influence that the EU wants to exert is not limited to the regulations that shape the international business environment, raising standards around the world, but is also complemented by active digital diplomacy and the search for international alliances that, spreading key European values, pragmatically try to ensure good relations. Open digital autonomy requires more effort and innovation in the field of digital diplomacy, especially with the EU's historic transatlantic partner – United States of America. With a total allocation of €79.5 billion, the new Global Europe programme will cover the EU's cooperation with all third countries, so it can be an important contribution to the transition from ambition to action in leading the digital decade and promoting the EU's role as a reliable and priority partner worldwide.<sup>24</sup>

According to the Programme, the digital objectives of the European Parliament, the Council, the Commission and the Member States by 2030 include:

1. A digitally qualified population and highly qualified digital professionals with the aim of achieving gender balance, where at least 80% of those aged 16 to 74 have at least basic digital skills, and where at least 20 million Information and Communication Technology (ICT) specialists are employed in the EU, with the promotion of access to this field and increasing the number of ICT graduates;
2. Secure, resilient, efficient and sustainable digital infrastructures, where all end-users at a fixed location are covered by a gigabit network to the end point of the network, and all populated areas are covered by next-generation high-speed wireless networks with performance that is at least 5G equivalent, in accordance with the principle of technological neutrality, then where the production of state-of-the-art semiconductors in the EU, in accordance with EU environmental sustainability law, it is at least 20% of the value of world production and where at least 10,000 climate-neutral highly secure edge nodes are deployed in the EU, in a way that guarantees access to low-latency data services (i.e. milliseconds) wherever businesses are located, and finally where the EU can reach the first quantum acceleration computer by 2025, thus its digital potential could be at the peak of quantum capabilities by 2030;

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<sup>24</sup> Codagnone, Cristiano, Liva, Giovanni, Gunderson, Laura, Misuraca, Gianluca, Rebesco, Emanuele, "Europe's digital decade and autonomy", Study Requested by the ITRE Committee. Policy Department for Economic, Scientific and Quality of Life Policies, European Parliament, Luxembourg, 2021.

3. Digital transformation of enterprises, where at least 75% of EU companies have taken over, in accordance with their business, cloud computing services, big data or artificial intelligence;
4. More than 90% of SMEs in the EU reach at least a basic level of digital intensity;
5. The EU facilitates the growth of its innovative enlargements and improves their access to finance, leading to at least a doubling of the number of so-called unicorns;<sup>25</sup>
6. Digitalization of public services, where key public services are 100% online and where it is possible for citizens and businesses in the EU to interact with public administration online;
7. 100% of EU citizens have access to their electronic health records;
8. 100% of EU citizens have access to secure electronic identification (eID) means recognized across the EU, allowing them to have full control over transactions involving their identity and the personal data they share.<sup>26</sup>

The Commission will monitor the EU's progress towards general and digital targets, relying on the Digital Economy and Society Index and identify a key performance indicator for each digital objective. In order to achieve this, Member States will provide the Commission in a timely manner the necessary statistics and data necessary to effectively monitor the digital transformation and the degree of achievement of digital objectives. This data will, wherever possible, be broken down by gender and region in accordance with EU and national law. Where relevant statistics from Member States are not available, the Commission may use an alternative data collection methodology, such as studies or direct collection of data from Member States, in consultation with those Countries, taking into account regional levels. The use of an alternative data collection methodology will not affect the tasks of the Commission (Eurostat) as set out in Commission Decision 2012/504/EU.<sup>27</sup> The Commission will also, in close cooperation with the Member States, establish projected paths at EU level for each of the digital objectives. These projected paths will serve as a basis for monitoring and for national strategic road maps for the digital decade of member states (national roadmaps). Where necessary, in the light of technical, economic or social

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<sup>25</sup> The word „unicorn“ in this context means a startup or a company worth above 1 billion USD.

<sup>26</sup> Decision (EU) 2022/2481, op.cit., Article 4.

<sup>27</sup> “Commission Decision 2012/504/EU of 17 September 2012 on Eurostat”, Official Journal of the European Union L 251, 18.9.2012.

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developments, the Commission shall, in close cooperation with the Member States, update one or more of those projected pathways. The Commission will report in a timely manner to the European Parliament and to the Council on the projected routes at EU level and their updates.<sup>28</sup> By 9 October 2023, each Member State will submit its national roadmap to the Commission. National roadmaps must contribute to the achievement of general and digital goals at EU level and must be consistent with them. The Commission will submit its first Digital Decade Report by 9 January 2024. EU Decision 2022/2481 provides that the Commission and the Member States work closely with each other to identify ways to address gaps in areas where the Commission and the Member States consider that progress towards one or more digital objectives is insufficient, or where there are significant gaps and gaps. The analysis should take into account the different capacities of Member States to contribute to the achievement of digital targets and the risks of delays that may have a detrimental impact. On the one hand, the Commission will consult private and public stakeholders, including representatives of SMEs, social partners and civil society, to gather information and develop recommended policies, measures and actions for the purpose of implementing EU Decision 2022/2481. On the other hand, Member States shall consult private and public stakeholders, including representatives of small and medium-sized enterprises, social partners and civil society, as well as regional and local representatives, when adopting their national roadmaps.<sup>29</sup>

EU's Decision 2022/2481 also provides for projects involving more countries and at least three EU Member States in order to facilitate the achievement of general and digital objectives. A third country may participate in a multi-country project if that country is linked to an EU programme directly managed and supporting the EU's digital transformation and if its participation is necessary to facilitate the achievement of the EU and Member States' general and digital objectives. Such an associated third country, including its financial contributions, must comply with the rules arising from EU programmes and investment schemes contributing to a multi-country project.<sup>30</sup> Member States may implement the project in more than one country through the European Digital Infrastructure Consortia.<sup>31</sup> Issues of establishment, objectives, status, membership, governance, statute, responsibilities, applicable rights and competences, control, reporting and

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<sup>28</sup> Decision (EU) 2022/2481, op.cit., Article 5.

<sup>29</sup> Decision (EU) 2022/2481, op.cit., Article 9.

<sup>30</sup> Ibid, Article 11.

<sup>31</sup> The European digital infrastructure consortia (EDIC).

liquidation of European consortia for Digital infrastructure is regulated by the provisions of Article 13 to Article 21 of EU's Decision 2022/2481.

## CONCLUSION

The 2030 Digital Decade Policy Programme – creates a new framework for projects in EU Member States and third countries to achieve the objectives of the digital initiative. The priorities that should be pursued on this front are covered by the comprehensive implementation of achievements and innovations in digital technology, the implementation of which could lead to social prosperity and progress.<sup>32</sup> The Republic of Serbia has a particular interest in being part of the digital transformation through the achievement of the objectives envisaged by the Digital Decade Policy Programme. It can work on developing its digital capabilities through the development of highly qualified engineers. Serbia can also take advantage of its opportunity in the implementation of large digital projects of the EU, since the EU's goal is to achieve greater connectivity across the continent in order to improve the digital infrastructure for small and medium-sized enterprises developing cross-border activities. In order to facilitate the achievement of these general and digital goals, the 2030 Digital Decade Policy Programme also envisages projects involving several countries, where Serbia can also take advantage of its chance. A third country can participate in a multi-country project, if it is linked to an EU programme supporting the EU's digital transformation. A third country may also participate in the project if its participation is necessary to facilitate the achievement of the EU's general and digital objectives, as well as the individual objectives of the Member States. Of course, everything that is done must be in accordance with Decision (EU) 2022/2481 and the rules arising from EU programmes, and investment schemes that contribute to the implementation of projects involving several countries (for example, in the field of optical fiber development, quantum computing, microelectronics, 5G, cloud computing and other digital technologies).

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<sup>32</sup> Jelisavac Trošić, Sanja, "Serbia in EU and WTO negotiations", Revizor, 2020, pp.49-55.

"Commission Decision 2012/504/EU of 17 September 2012 on Eurostat", Official Journal of the European Union L 251, 18.9.2012.

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## THE IMPORTANCE OF ARTIFICIAL INTELLIGENCE IN THE FIGHT AGAINST MONEY LAUNDERING<sup>33</sup>

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**Abstract:** *Thanks to the fast lifestyle, the rapid improvement of financial technology, and the inevitable connection of the financial sector with virtual transactions and the increase of opportunities for cybercriminals, led to the introduction of artificial intelligence, in order to find a way to improve protection mechanisms in the fight against money laundering. The previous AML approach has been upgraded to a new risk-based approach.*

*In the paper, the authors explore the importance of artificial intelligence in the fight against money laundering. A new risk-based approach to AML that uses artificial intelligence can reduce costs in retail banking, insurance services, and correspondent banking. In order to investigate the importance of artificial*

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<sup>33</sup> This paper is a part of the research results on project U 01/2023 Green economy in the era of digitization, realized by Faculty of Finance, Banking and Auditing, Alfa BK University from Belgrade, Serbia.

*intelligence in the fight against money laundering, the paper used authorized data from national and international financial organizations that deal with the fight against money laundering. The time series used in the paper include data related to the period from 2016 to 2022. All data used in the work from 2018 to 2022 were processed on an annual basis.*

**Key words:** *Artificial Intelligence, money laundering, New risk-based approach to AML, risks.*

## ZNAČAJ VEŠTAČKE INTELIGENCIJE U BORBI PROTIV PRANJA NOVCA

**Apstrakt:** *Zahvaljujući brzom načinu života, rapidno unapređenje finansijske tehnologije, i neminovne veze finansijskog sektora sa virtuelnim transakcijama i povećanjem mogućnosti za sajber kriminal, dovelo je do uvođenja veštačke inteligencije, kako bi se pronašao način unapređenja mehanizama zaštite u borbi protiv pranja novca. Dosadašnji AML pristup je unapređen u nov pristup zasnovan na riziku.*

*Autori u radu istražuju značaj veštačke inteligencije u borbi protiv pranja novca. Nov pristup AML, zasnovan na riziku koji koristi veštačku inteligenciju, može smanjiti troškove u bankarstvu na malo, uslugama osiguranja, kao i korenspodentskom bankarstvu. Kako bi se istražio značaj veštačke inteligencije u borbi protiv pranja novca, u radu su korišćeni ovlašćeni podaci nacionalnih i međunarodnih finansijskih organizacija koje se bave borbom protiv pranja novca. Vremenske serije korišćene u radu obuhvataju podatke koji se odnose na period od 2018. do 2022. godine. Svi su korišćeni podaci u periodu od 2018. do 2022. godine u radu obrađeni na godišnjem nivou.*

**Ključne reči:** *Veštačka inteligencija, pranje novca, Nov pristup borbe protiv pranja novca zasnovan na riziku, rizici.*

### INTRODUCTION

Thanks to the fast lifestyle, the rapid improvement of financial technology, and the inevitable connection of the financial sector with virtual transactions and the increase of opportunities for cybercriminals, led to the introduction of artificial intelligence, in order to find a way to improve protection mechanisms in the fight against money laundering. Money laundering and terrorist financing are financial crimes with economic effects. They can

break the stability of a country's financial sector or its external stability in general. Effective prevention of money laundering and the fight against terrorism financing are essential for protecting the integrity of the market and the global financial framework that influence the mitigation of factors that facilitate financial abuse.

The previous AML approach has been upgraded to a new risk-based approach. In the paper, the authors explore the importance of artificial intelligence in the fight against money laundering. A new risk-based approach to AML that uses artificial intelligence can reduce costs in retail banking, insurance services, and correspondent banking.

## **1. METHOD AND SUBJECT OF RESEARCH**

The research method used in the work is descriptive analysis, the induction method and the deduction method, as well as the analysis of the content of the available literature and the set subject and goal of the research is to investigate the importance of artificial intelligence in the fight against money laundering, the paper used authorized data from national and international financial organizations that deal with the fight against money laundering. The time series used in the paper include data related to the period from 2018 to 2022. All data used in the work from 2018 to 2022 were processed on an annual basis.

## **2. RESEARCH RESULTS AND DISCUSSION**

We can say that there are several types of artificial intelligence that exist at different levels of autonomy, but in general, artificial intelligence (AI) systems combine intent, intelligence and adaptability. (FATF, 2021) Machine learning offers the greatest advantage through its ability to learn from existing systems, reducing the need for manual input into monitoring, reducing false positives and identifying complex cases, as well as facilitating risk management.

Artificial intelligence is very important in the fight against money laundering. It provides a number of advantages that are significant in the fight against money laundering. New technologies have contributed to the great challenges that international institutions face in the fight against money laundering. In order to reduce the risk of money laundering, every year countries are ranked according to Basel AML Index.



Ranking the country according to the degree of risk of money laundering and terrorist financing is a significant step towards in fight against money laundering. (Joksimovic, Beke Trivunac and Siljanoska, 2020) The Basel Money Laundering Index (Basel Institute for Governance, 2022) is an independent annual ranking that assesses the risk of money laundering and terrorist financing (ML/TF) worldwide.

Eighteen indicators are included in the assessment, which countries comply with AML/CFT regulations, the level of corruption, financial standards, political disclosure and the rule of law, all of which make up the overall risk assessment. By combining these data sources, the overall risk assessment provides a holistic assessment that addresses the structural and functional elements of a country's resilience to ML/TF.

Over the past 11 years since the Basel AML Index was first published, the average global money risk the laundry has changed depressingly little. The year 2022 is no exception, with an average level of risk decreasing by a negligible 0.05% to 5.25 out of 10, where 10 is the maximum level of risk. Changes in methodology and country coverage make accurate year-to-year comparisons challenging, but great the picture is clear: we do not see significant progress in the fight against money laundering at the global level.

**Table 1.** Assessing AML risks and trends in a changing world 2018-2022

2018	2019	2020	2021	2022
5.63	5.39	5.22	5.30	5.25

*Source:* Authors on data Basel Institute on Governance

For the fight against money laundering, FATF has allocated a certain budget, which is shown in Table no 2.

**Table 2.** Budget of the FATF for fiscal years from 2017 to 2020 (in EUR)

BUDGET ITEMS	2017	2018	2019	2020
Staff costs (salaries and indemnities)	3 306 233	4 467 488	6 152 201	8 217 852
Travel	606 220	441 177	910 022	1 641 873
Operating costs (incl. office rental)	235 563	413 923	651 000	782 034
OECD overhead charges	388 083	383 100	525 214	525 214

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Meeting costs, translation, interpretation	125 079	335 000	255 000	230 000
IT: investments and maintenance costs	179 814	166 471	723 800	417 287
Total	4 839 992	6 227 159	9 207 423	11 814 260

*Note:* The 2018 figures include both the budget financed by members' fees and by other sources of income, the 2017 figures only include budget financed by members' fees

*Source:* Authors on data FATF Annual Report 2017-2020

In the Table no. 3 authors show FATF and FATF member and observer countries.

**Table 3. FATF members**

FATF MEMBERS		
Argentina	Hong Kong, China	Portugal
Australia	Iceland	Russian Federation
Austria	India	Saudi Arabia
Belgium	Ireland	Singapore
Brazil	Israel	South Africa
Canada	Italy	Spain
China	Japan	Sweden
Denmark	Korea	Switzerland
European Commission	Luxembourg	Turkey
Finland	Malaysia	United Kingdom
France	Mexico	United States
Germany	Netherlands, Kingdom of	Norway
Greece	New Zealand	Gulf Co-operation Council
FATF OBSERVER		
Indonesia		

*Source:* Authors on data FATF Annual Report 2017-2020

**Table 4. FATF Associate members**

FATF ASSOCIATE MEMBERS
Asia/Pacific Group on Money Laundering (APG)

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Caribbean Financial Action Task Force (CFATF)
Council of Europe Committee of Experts on the Evaluation of Anti-Money Laundering Measures and the Financing of Terrorism (MONEYVAL)
Eurasian Group (EAG)
Eastern and Southern Africa Anti-Money Laundering Group (ESAAMLG)
Financial Action Task Force of Latin America (GAFILAT)
Inter-Governmental Action Group against Money Laundering in West Africa (GIABA)
Middle East and North Africa Financial Action Task Force (MENAFATF)
Task Force on Money Laundering in Central Africa (GABAC)

Source: Authors on data FATF Annual Report 2017-2020

AI technology functions on the principle of differentiating between normal and abnormal transactions, which helps in the easy identification of risky behaviours and patterns (Ahajeri, R and Alhashem, A., 2023) Complex algorithms and big data analytics are essential in classifying customers, identifying suspicious transactions, and improving the quality of risk analysis (Chen, T.H., 2020).

## CONCLUSION

The fight against money laundering is too important and too complex for governments to fight alone. That is why international institutions dealing with the fight against money laundering make recommendations to make the fight against money laundering more effective.

On the one hand, thanks to artificial intelligence, the fight against money laundering is more effective, and on the other hand, thanks to new technologies, money launderers are increasingly one-step ahead. Constant education and training of all who participate in the process of combating money laundering is necessary in order to achieve adequate results.

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## THE IMPORTANCE OF DIGITIZATION OF TAX ADMINISTRATION IN THE REPUBLIC OF SERBIA

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**Abstract:** *After three industrial revolutions, a fourth is underway in the world, which will completely eliminate the gap between technology and people and will affect everything we do. Digital transformation or digitization is a global phenomenon, so it has not bypassed Serbia either. The Government of the Republic of Serbia has recognized the importance of digitization and the development of electronic administration, thus transformed public administrations will change the way they work, will become more economical, better performing their tasks and more transparent in their work.*

*The tax administration in Serbia, like other administrations in the state apparatus, saw the need to improve its operations and adapt to the development of technology. The tax administration has taken significant steps in the digitization process, which relate to the transition from paper to digital data, the creation of the e-taxes portal. This portal is a set of electronic services of the Tax Administration of the RS, which give all taxpayers the opportunity to submit electronically signed tax return forms, to monitor the status of sent returns, and to have insight into the state of the taxpayer's accounts. The introduction of the e-taxes portal achieves the goal of easier and simpler fulfillment of obligations towards the tax administration. This system meets high security standards and enables secure data transmission electronically.*

*Increasing the collection of public revenues is the main goal of every tax administration, and in order to achieve it, it is necessary to increase the efficiency of the tax administration through the redesign of existing business processes. This implies optimization of existing, introduction of new and exclusion of outdated business processes. The aim of the paper is to show how using new*

*technologies, affects the reduction of costs and the time required for the fulfillment of tax obligations, which makes the tax administration more efficient and present for the taxpayer in any place and at any time. Therefore, by using the possibilities of various digital platforms, the state would have stable revenues for a longer period of time, and taxpayers a predictable tax system.*

**Keywords:** *tax administration, digitization, e-taxes, new technologies.*

## INTRODUCTION

After three industrial revolutions, a fourth is underway in the world, which will completely eliminate the gap between technology and people and will affect everything we do. Digital transformation is a global phenomenon, so it has not bypassed Serbia either. The Government of the Republic of Serbia has recognized the importance of digitization and the development of electronic administration, thus transformed public administrations will change the way they work, will become more economical, better performing their tasks and more transparent in their work.

In 2014, the government adopted the Recommendations of the OECD Council on digital government strategies. The document emphasizes that with the introduction of digital technologies in public administration, their use is integrated into efforts to modernize the public sector.

Also, in 2017, the RS Government established the Office for Information Technologies and Electronic Government, which performs state administration tasks related to: development and application of standards and measures in the introduction of information and communication technologies in state administration bodies and government services. During 2019, the Digital Summit of the Western Balkans was held, initiated by the Berlin Process in Belgrade, and great political support and understanding for the process of digital transformation was expressed then. The regional exchange of knowledge, the connection of electronic services within the region, all for the development of the regional economy, are cited as advantages. The program of dissemination of knowledge in the field of digital transformation "Serbia Digitizes" is an instrument of cooperation between the Republic of Serbia and partner countries in the domain of digital transformation. The goal of the Program is the establishment of new and improvement of existing forms of partnerships, based on knowledge and mutual strengthening of

capacities needed for digital transformation and support for the development of electronic administration.

Some of the laws adopted to regulate the field of e-government are:

- The Law on Electronic Administration, this law regulates the administration of state bodies and organizations, bodies and organizations of provincial autonomy, bodies and organizations of local self-government units, institutions, public companies, special bodies through which the regulatory function is exercised, and legal and natural persons who are entrusted with public authorities (hereinafter referred to as the authority) using information and communication technologies, i.e. the conditions for establishing, maintaining and using interoperable information and communication technologies of the authority (hereinafter referred to as electronic administration).

- Law on information security, this law regulates protection measures against security risks in information and communication systems, the responsibilities of legal entities when managing and using information and communication systems, and determines the competent authorities for the implementation of protection measures, coordination between protection factors and monitoring of proper application prescribed protection measures.

- The program for the development of electronic administration in the Republic of Serbia for the period from 2020 to 2022 with the Action Plan for its implementation is a public policy document by which the Government plans the development of electronic administration in the Republic of Serbia for that period. , Ministries of State Administration and Local Self-Government and on the eAdministration Portal.

## **1. GUIDELINES FOR PRIORITIZING ADMINISTRATIVE PROCEDURES FOR DIGITIZATION**

In 2021, Guidelines for the prioritization of administrative procedures for digitization with instructions were prepared. In order to improve public administration services according to the needs of citizens and the needs of the modern economy, it is necessary to improve administrative capacities and

infrastructure for the provision of digital services. This proved especially important during the crisis caused by the COVID.

A significant step forward was made through the e-PAPER Program, with the establishment of the Register of administrative procedures, which contains about 2,600 administrative procedures, which are available to businessmen through the portal. The e-PERMIT platform represents a modern infrastructure for simple digitization of a large number of administrative procedures, i.e. services in a unique and comprehensive way. The digital provision of public services directly affects the quality of life of citizens and the business operations of economic entities and leads to significant savings in money and time for the users of these services.

What are the conditions for providing public services?

A key requirement in the process of providing public services is that the public administration is citizen-oriented and ensures the quality and accessibility of public services. The standard in the behavior of public servants and the operational performance of the public administration in the provision of services include:

- reliability and predictability (legal certainty),
- openness and transparency,
- responsibility,
- efficiency and effectiveness.

These Guidelines are designed to support the public administration in conducting an analysis of the existing service provision framework and should answer the following questions: what services we provide, to whom, and in what way, and determining priorities in the digitization of services, i.e. administrative procedures. It is important to describe administrative procedures, as far as that procedure is regulated by regulations, because a procedure that has clearly defined steps is easier to digitize than a legally unregulated procedure.

Who are the users of services, that is, administrative procedures and through which channels are they provided?



There are two types of channels: Analog (physical) options for providing services are Digital (almost always contactless) Digital services are provided through electronic portals (web pages) of public administration bodies and organizations, through which service users are enabled to access the request form, make payment services and submit a request. A digital service implies a fully automated process, that is, it means that the citizen's request is processed electronically and that the final decision or some other act is delivered to the user of the service electronically in electronic form.

Challenges in the process of implementing digitization?

- personnel, in order for the digitization process to be successful in any public administration body, it is necessary to have the ability of the officials to transform the service into a digital one, as well as the necessary knowledge and skills of the employees to effectively ensure the provision of the service within the prescribed time limits in digital form.

- finances, i.e. whether you have secured funds for the digitization of the service and how much financial funds are needed for the digitization of the service if the funds are not secured. Here it is important to list all the costs related to the digitization of the services as well as the funds needed for training and equipment in order to ensure a smooth providing services in digital form.

- information security, citizens and the economy could feel during the cyber-attack on the digital infrastructure of the Republic Geodetic Institute (RGZ), which resulted in the impossibility of trading real estate, registering mortgages and realizing other jobs related to real estate. According to the RGZ, after the cyberattack, the entire RGZ system was locked as a precaution to protect data, and all of the above resulted in the fact that citizens, banks, notaries and state institutions did not have access to the property register for several weeks.

## **2. SCOPE OF DIGITIZATION OF TAX ADMINISTRATION IN THE REPUBLIC OF SERBIA**

Tax policies achieve different goals. While tax revenues provide governments with important funding to meet social (education, health, social

security) and infrastructure needs, they also influence economic decisions in areas such as investment, production, labor supply and demand, and savings. Therefore, structural tax reforms should aim at building a competitive fiscal environment that on the one hand encourages investment, risk-taking and entrepreneurship, and on the other hand aims at optimizing tax revenues by, for example, discouraging tax evasion.

Establishing an efficient tax administration is part of a successful tax policy. A well-functioning tax administration is necessary to reduce the costs of tax compliance control and to minimize the administrative costs of governments. Reforms in the tax administration are aimed at modernizing the management of tax administrations and their operational structures, as well as upgrading and increasing the range of services for taxpayers.

The tax administration in Serbia, like other administrations in the state apparatus, saw the need to improve its operations and adapt to the development of technology. The tax administration has taken significant steps in the digitization process, which relate to the transition from paper to digital data, the creation of the e-taxes portal. This portal is a set of electronic services of the Tax Administration of the RS, which give all taxpayers the opportunity to submit electronically signed tax return forms, to monitor the status of sent returns, and to have insight into the state of the taxpayer's accounts. The introduction of the e-taxes portal achieves the goal of easier and simpler fulfillment of obligations towards the tax administration. This system meets high security standards and enables safe transmission of data electronically.

Done on the plan of digitalization of the tax administration in Serbia:

- from March 2014, the application of the unified collection of taxes and contributions by deduction,
- at the beginning of 2018, the tax administration completed the process of digitalizing the submission of tax returns,
- introduced a number of useful electronic services for taxpayers, of which perhaps the most significant are the issuance of electronic certificates introduced in the first half of 2019 (on paid obligations on all public revenue payment accounts, certificates on paid health insurance contributions,

certificate on paid value added tax and certificate of paid taxes and withholding tax contributions)

- in the first half of 2020, an electronic mailbox for self-employed income tax payers who are taxed flat-rate. in electronic form through the portal of the Tax Administration without the need for physical contact.

- the Law on Fiscalization was adopted, which replaced the previous Law on Fiscal Cashiers. Its implementation began on January 1, 2022, with a transition period for adjusting the economy until May 1, 2022. The most important novelties of this law are the wider scope of fiscalization, followed by electronic recording of transactions. in real time through an Internet connection between each fiscal device and the Tax Administration system, as well as the unique electronic elements of each account that enable its verification.

Increasing the collection of public revenues is the main goal of every tax administration, and in order to achieve it, it is necessary to increase the efficiency of the tax administration through the redesign of existing business processes. This implies optimization of existing, introduction of new and exclusion of outdated business processes. By using new technologies, it affects the reduction of costs and the time required to fulfill tax obligations, which makes tax administration more efficient and present for the taxpayer in any place and at any time. Therefore, by using the possibilities of various digital platforms, the state would have stable revenues for a longer period of time, and taxpayers a predictable tax system.

In addition to the challenges that exist in the tax system in Serbia: the gray economy, tax laws and by-laws that are often complex and require a high level of expertise in order to be properly applied, the capacities and expertise of the tax administration, the high tax burden on the economy, uneven practice, tax discipline, there are certain perspectives for improving the tax system in Serbia. One of the perspectives is the digitalization of the Tax Administration, which would enable more efficient communication between the tax administration and taxpayers, reduce administrative costs and increase transparency in the tax system. The introduction of electronic invoicing, electronic tax reporting and the use of data from other sources, such as bank

data, is a good way to increase the efficiency of the tax system and reduce tax evasion.

Following the example of a large number of EU countries, it is extremely important to use centralized databases and enable the exchange of data between the Tax Administration and companies, especially financial institutions.

### **3. PORTAL ePOREZI**

The "ePorezi" portal is a set of electronic services of the Tax Administration of the Republic of Serbia, which enables all taxpayers to submit electronically signed tax return forms, monitor the status of sent returns, view the state of the taxpayer's accounts and grant/revoke authorization to use electronic services. In this way, taxpayers can fulfill their obligations towards the Tax Administration faster, easier and simpler. This system meets high security standards and enables safe and uncompromised data transmission electronically.

To access electronic services on the "ePorezi" portal, a unique, specially designed ePorezi application is used. Advantages of using the application:

- monitoring the standards and development of the information society,
- improvement of business processes using information and communication technologies,
- easier, simpler and faster fulfillment of obligations towards the Tax Administration,
- better informing taxpayers about their rights and obligations.

Through the "ePorezi" portal, taxpayers can fill in, sign and forward tax return forms to the Tax Administration. Taxpayers can customize their accounting software so that it automatically generates a file in the appropriate format and electronically signs and forwards such file to the Tax Administration directly through the "eTaxes" portal.

Also, the "ePorezi" portal enables insight into the state of the taxpayer's accounts, insight into data from the Unified Register of Taxpayers, as well as an overview of previously sent tax returns filed electronically. Through the "eTaxes" portal, taxpayers have the option of granting/revoking authorization for the use of electronic services. All activities performed by the taxpayer through the "ePorezi" portal are free of charge.

PU was the first to introduce the unified collection of taxes and contributions by deduction, and it was the first major mandatory mass electronic service in Serbia. Today, except for unified billing, all other tax returns can be submitted electronically. During the application of the unified collection of taxes and withholding contributions, which began on March 1, 2014, a total of 41,877,633 correct PPP PD applications were submitted electronically, ending in July 2023. On average, more than 370,000 of these applications were received per month through the electronic service of the Tax Administration. The ePOREZI service functions successfully, and the technical capacities for receiving and processing tax returns are ready for further development of new services. In this example of digitization in the PU, we see that the need for personal visits has been eliminated and the possibility of human error has been eliminated, and that the process of complying with tax regulations has been accelerated.

At the end of 2021, the National Assembly of the RS adopted the Law on Fiscalization, which replaced the previous Law on Fiscal Cashiers, implementation began on January 1, 2022, with a transition period for adjusting the economy until May 1, 2022. The most important novelties of this law are wider coverage of fiscalization, then electronic recording of transactions in real time via the Internet connection between each fiscal device and the Tax Administration system, as well as unique electronic elements of each account that enable its verification. In order for the project to be successful, the state allocated 3 billion dinars for the implementation of the new fiscalization system. The law is neutral regarding the devices used and the combination of software and hardware that can be applied, which spares the economy the high costs of switching to a digital, online fiscalization system. The new system was successfully implemented and in the coming period is expected to achieve the effects of increasing tax

revenues, but also more effective control and risk analysis in order to prevent tax evasion.

In 2022, the Office for Information Technologies and Electronic Administration continued its activities in terms of enabling the application of new technologies (such as a qualified electronic certificate and signature in the cloud) and digitalization of state administration and the economy. In accordance with the Fiscalization Law, the transition to a new model of e-fiscalization implies the use of a new hardware or software solution, whereby fiscal invoices with a QR code are issued. Mobile operators contributed to facilitating the transition of the economy to a new model of e-fiscalization by creating an offer of modern hardware and software solutions that enable business entities to operate in accordance with the new Law on Fiscalization.

According to the data published on the portal of the Tax Administration, up to 11 million invoices are issued daily through electronic fiscal devices. One of the parts of the electronic fiscal device is the security element, which can be issued in the form of a smart card or a file. The Tax Administration issues it to all tax payers for each registered point of sale and within the point of sale for each fiscal device.

The new system allows the Tax Administration to have data on issued fiscal invoices in real time, and therefore the control of taxpayers is more efficient. From 01.05.2022. until September 2022, Tax Administration inspectors performed over 9,500 controls. Of that number, it was determined that 1,700 taxpayers do not issue fiscal invoices.

#### **4. COMPONENTS OF THE FUTURE DEVELOPMENT OF TAX ADMINISTRATION**

By realizing the strategic goals of the new Transformation Program 2021-2025. The foundations of the new architecture of the Tax Administration are being created, which are visible to citizens, the economy and employees of the Tax Administration through three "products", i.e. components:

The first component, an integrated information system, based on COTS (Commercial off the shelf solution), which crosschecks and checks most of the data, whether it is in the Tax Administration or comes from third parties,

all for the purpose of identification taxpayers who do not operate in accordance with the compliance policy.

The second component is the taxpayer's personal e-portal, which represents the basic model of communication with the Tax Administration, which essentially represents a digital service adapted to the taxpayer. At the same time, it is a module for constant communication on all issues between the Tax Administration and the taxpayer - filing tax returns, paying tax obligations, issuing tax certificates, insight into the taxpayer's tax accounting, submitting requests for rebooking and refunds, submitting other requests, receiving various notifications, tax acts and other issues. Through the personal e-portal, the taxpayer fulfills his tax obligations and realizes his rights from the tax procedure.

The third component is the formation of a new profile of a tax officer with an exceptional level of professionalism and competence, which, together with other activities of the Tax Administration, will significantly raise the reputation of the institution.

The Tax Administration has the task of significantly increasing the capacity of the risk management system, and for this it is necessary to continue introducing new, sophisticated tools for risk analysis. More sophisticated risk management should enable the control function to work more efficiently, which will be seen by increasing the additional tax obligations determined in the control procedure, as well as reducing the tax gap in general. The redesign of control techniques in accordance with the best international practice, the introduction of e-control software, as well as the education of inspectors in the field of international taxation, should contribute to the reduction of the gray economy, the abuse of international agreements on the avoidance of double taxation, contribute to the fulfillment of the obligations of the Tax Administration arising from the accession to the Global forum as well as international tax evasion in general.

The Tax Administration will ensure the transfer of knowledge and the hardware and software equipment of the appropriate organizational parts in order to adequately administer transfer prices. The key assumption for risk management, as well as for the control and collection of public revenues, is the introduction of a redesigned business operating system that is supported

by a modern integrated information system for the following segments: taxpayer register, tax calendar, submission and processing of tax returns, receipt and processing of payments, tax accounting, analysis and forecasting and software for administering individual tax forms. The design of these business processes and integrated IT support must meet the highest criteria of the Tax Administration Diagnostic Assessment (TADAT), i.e. the best international practices in these areas in order to ensure data integrity.

Such a redesigned business model, which is significantly automated, also creates an infrastructural premise for centralizing the submission and processing of tax returns and payments. It is also a necessary condition for the functioning of the risk management system and the efficient functioning of the service provision system. The implementation of the new business model, which is supported by an integrated information system, requires that the public administration of the Republic of Serbia in the part of information that is important for taxation be in the form of structured data that enables the availability of data in an optimal period of time, which implies real time in the Tax Administration. This means that the implementation of e-administration in the part of the database that is necessary for the Tax Administration follows the Tax Administration Transformation Program in time because it is a condition for the transformation of the Tax Administration. If the time coordination of this process is not ensured, certain business processes will significantly threaten the efficiency of key tax functions. The Government of the Republic of Serbia and the Ministry of Finance will support the amendment of that part of the legal framework that enables the Tax Administration to download all necessary data from the relevant registers for the purposes of, first of all, the efficient performance of basic tax functions in accordance with legal powers, as well as tax risk management.

## **CONCLUSION**

Increasing the collection of public revenues is the main goal of every tax administration, and in order to achieve it, it is necessary to increase the efficiency of the tax administration through the redesign of existing business processes. This implies optimization of existing, introduction of new and



exclusion of outdated business processes. By using new technologies, it affects the reduction of costs and the time required to fulfill tax obligations, which makes tax administration more efficient and present for the taxpayer in any place and at any time. Therefore, by using the possibilities of various digital platforms, the state would have stable revenues for a longer period of time, and taxpayers a predictable tax system.

The tax administration in Serbia, like other administrations in the state apparatus, saw the need to improve its operations and adapt to the development of technology. The tax administration has taken significant steps in the digitization process, which relate to the transition from paper to digital data, the creation of the e-taxes portal. This portal is a set of electronic services of the Tax Administration of the RS, which give all taxpayers the opportunity to submit electronically signed tax return forms, to monitor the status of sent returns, and to have insight into the state of the taxpayer's accounts. The introduction of the e-taxes portal achieves the goal of easier and simpler fulfillment of obligations towards the tax administration. This system meets high security standards and enables secure data transmission electronically.

In order to achieve greater efficiency and business security, it is necessary to enable the automated exchange of data between the public and private sectors. For example, ensure the exchange of data with the Tax Administration, the Social Security Registry and the Credit Bureau in order to assess the actual creditworthiness and protect against fraud. Also, enable the delivery of documentation by service providers to citizens through the unique eGovernment electronic inbox.

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## CHARACTERISTICS AND APPLICATION OF BLOCKCHAIN TECHNOLOGY

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**Abstract:** *This paper investigates the characteristics and current as well as possible innovative applications of blockchain technology. A blockchain is an encrypted record of all previous transactions and settlements that each linked computer constantly synchronizes. Theoretically, blockchain data is absolutely reliable because there are thousands of copies of the data. The main characteristic of blockchain technology is that there is no specific entity in charge of the Distributed Ledger Technology (DLT). This is the main reason why blockchain technology has a stimulating effect on innovative solutions in many areas of human activity. Blockchain technology also has a positive impact on the different fields of business activities, so in this paper will be presented possible application of this technology. There is no doubt that blockchain technology, in addition to being the basis of Bitcoin as the leading cryptocurrency, is above all the fundamental infrastructure of modern and future economic development, innovation, entrepreneurial ventures, and ultimately social reforms. In this context, during last decade, and especially in the last few years, the development of a whole series of new technological, financial and we can say monetary products, is making the world more productive, more efficient and more inventive in every business aspect. Existing and future entrepreneurs and innovators face a huge number of business opportunities, but also challenges to make the best use of the opportunities provided by blockchain technology. The analytical approach applied in this paper points to the comprehensive impact of blockchain technology on achieving the goals of business development in the closest future.*

**Keywords:** *Bitcoin, blockchain technology, DLT, innovative solutions.*

## INTRODUCTION

Blockchain is another name for a distributed or decentralized ledger technology (DLT). The technical essence of this structure is a single distributed database accessible to all, where anyone in the world can see balances and send transactions at any time, but where the distributed ledger technology is not controlled by any single corporation, government, person or entity. Blockchain is widely considered a distributed ledger maintained jointly by the participants [4]. A blockchain is an encrypted record of all previous transactions or changes and that is constantly refreshed by every networked computer. In theory, blockchain data is absolutely reliable because there are thousands of copies of the data that are synchronized and mutually confirm the results. If each participant can agree on the status of the database at any time, the delays required to synchronize one database with another database can be significantly reduced, almost eliminated. Although the concept is simple, implementing this new database architecture involved overcoming several significant technical challenges.

The essence of blockchain technology is actually the creation of a timely consensus resistant to network participants who might intend to deform it, through all copies of a decentralized database. One such model incorporates in its construction a cascaded series of technological steps driven by smart incentives, cryptography and other technological advantages [8]. The potential advantages of blockchain technology are continuously analyzed, but there are still many obstacles that prevent the implementation of this technology in many fields of human activity. In this paper, the main characteristics of blockchain technology will be presented, as well as the most common applications of blockchain technology in the modern business environment.

### 1. KEY CHARACTERISTICS OF BLOCKCHAIN TECHNOLOGY

The key characteristics of the blockchain technology make this technology significant in the application of new business models in various business activities and areas of human activity. It is precisely the key characteristics of blockchain technology that make it innovative and applicable to various business activities. Blockchain technology allows its users to track, coordinate, and execute transactions in a peer-to-peer manner, as well as store information from a large number of devices, which enables the creation of applications that require no centralized entities [15]. This technology focuses

on making data easily accessible to its users through a peer-to-peer network and ensures data confidentiality and integrity using cryptographic mechanisms.

In the following lines, the key characteristics of blockchain technology are listed and explained. Then let's consider them in follow order:

- 1) *decentralization* is perhaps the most important characteristic of blockchain technology. Since the blockchain system adopts the P2P networking mode, there is no mandatory control center [9], it is maintained by a network of nodes instead of a single entity [15]. Each node in the observed network has equal status in the overall system. These nodes have recorded and stored data about executed transactions, thus increasing the size of the database. This structure enables the validation of transactions between two peers without any authentication, jurisdiction or intervention by a central entity. In this way, an attack such as an insider threat can be absolutely avoided;
- 2) *openness and transparency* are the next important characteristic of blockchain technology. This technology uses mathematical algorithms to regulate the execution of transactions. Data exchanged between nodes in the system does not require mutual trust. At the same time, the applied rules are open and transparent. Anyone can verify the blockchain data using the hash value of the block header and the recorded information is backed up to multiple nodes. Updating information requires joint authentication of multiple nodes, which means that a certain node cannot deceive other nodes, so the information is highly transparent for the entire system [9];
- 3) *immutability* is next characteristic of the blockchain. This means that the structure of the blockchain cannot be changed without the participation of the majority of nodes. Given the fact that each link between blocks in the chain is the inverse hash point of the previous block, any change made to a block causes all subsequently generated blocks to be invalidated;
- 4) *traceability* which implies protection against data changes, security and credibility is also one of the significant features of blockchain technology. This characteristic implies that the data in the blockchain is permanently stored and that the information about the trading participant is linked to each record of the transaction in the blockchain. Thanks to the chronological order of transactions stored in the blockchain, users can trace and verify the origin of historical data in the blockchain. This facilitates transaction supervision and the cost of data tampering is much higher than the possible benefits, so

the probability of participants trying to tamper with the data is extremely low [9];

- 5) *automatic contract execution* also is one of the very important characteristics of the blockchain technology. Blockchain can form smart contracts by writing code, which stipulates the obligations that each party to the contract should perform, as well as the conditions for the performance of the contract. Once all determination conditions are met, the blockchain system will automatically apply the terms of the contract. On the one hand, it increases the efficiency of the execution of the contract, and on the other, it enables the execution of the contract without the supervision of a third party that would guarantee the execution of the contract;
- 6) the last among the most important features of blockchain is *anonymity*. This implies that blockchain systems have the ability to preserve some degree of anonymity by using public keys as pseudonymous addresses for blockchain users [15].

These key characteristics of blockchain technology make it a desirable tool for application of business models in various social segments. In the following part, it is shown where and in what way blockchain technology is most often used.

## 2. APPLICATION OF BLOCKCHAIN TECHNOLOGY

There is no doubt that blockchain technology, in addition to being the basis of Bitcoin as the leading cryptocurrency, is above all the fundamental infrastructure of modern and future economic development, innovation, entrepreneurial ventures, and ultimately social reforms. The pyramidal scheme of social, economic and administrative organization that has dominated almost the entire history of human civilization seems to have been replaced by a sustainable, reliable, networked paradigm of blockchain technology. In this context, during the last decade, and especially in the last few years, the development of a whole series of new technological products has been intensified, which greatly improve business in every aspect, precisely making it faster, more productive, more efficient and more inventive in every respect. Existing and future entrepreneurs and innovators face a huge number of opportunities, but also challenges to make the best use of the opportunities provided by blockchain technology. The following lines show those activities in which blockchain technology is most successfully and most often applied. In this sense, we have selected twelve areas of business and social activities in which we have the largest and most useful application of blockchain

technology. The range of these activities is very wide, which proves the importance of applying blockchain technology, as well as the possibilities of further exploitation of this technology. What are the areas of business or social activities where the application of blockchain technology is most often used? The following twelve activities have been selected:

- 1) Banking and financial services;
- 2) Healthcare;
- 3) Real Estate and Internet of Things;
- 4) Supply Chain Management;
- 5) Government;
- 6) Cybersecurity;
- 7) Social media;
- 8) Artificial Intelligence;
- 9) Media and Entertainment;
- 10) Secure personal information;
- 11) Voting;
- 12) Smart contracts.

### ***2.1. Banking and financial services***

Millions of people have expressed interest in cryptocurrencies and blockchain technology over the past decade. Bitcoin revolutionized cryptocurrencies by allowing financial transactions between unreliable users to take place without the need of intermediaries [5]. While consumers were focused on cryptocurrencies, banks used blockchain as the technology behind cryptocurrencies to improve their business standards.

*Banks* are successfully improving their services using new blockchain protocols and the best example is the Ripple blockchain. In April 2018, Banco Santander from Spain, launched the first blockchain-based money transfer service in the world. Santander One Pay FX service uses Ripple's blockchain to enable customers to make easier and faster international money transfers.<sup>34</sup> By automating this process this bank has reduced number of existing intermediaries required for international transactions. Based on the characteristics of the Ripple blockchain, such as decentralization, immutability, efficiency, cost-effectiveness and security, banks can execute transactions directly and with significantly lower settlement costs.

Systems based on blockchain technology have the potential to improve *capital markets*. Some of the benefits that blockchain technology offers to

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<sup>34</sup> <https://www.insiderintelligence.com/insights/blockchain-technology-applications-use-cases/>, accessed on 16<sup>th</sup> October, 2023



capital markets are: faster clearing and settlement, consolidated audit trail and operational facilitation. For example, startup Axoni was launched in 2013 and creates solutions for capital market improvement based on using of blockchain technology. Recently, the company announced the establishment of a distributed ledger network for the management of equity swaps - allowing parties involved in transactions to be synchronized and in constant communication, monitoring changes and notifying each other in real time.<sup>35</sup>

Many companies have established decentralized cryptocurrency *exchanges* in previous years. The use of blockchain technology in this case also made it possible to reduce the costs of transactions, as well as to speed them up. Furthermore, decentralized exchanges do not require from investors to make deposits to a centralized authority, which means investors have better control and security. Although exchanges based on the application of blockchain technology are primarily related to cryptocurrencies, this concept can be applied to traditional exchanges as well.

The most common application of blockchain technology in *insurance* is through smart contracts. Using such smart contracts can provide greater transparency for customers and insurance providers. All contracts and claims can be recorded on the blockchain and validated by the network, which would eliminate invalid claims. One good example is openIDL, a network created on the IBM Blockchain Platform with the American Association of Insurance Services.<sup>36</sup>

The highly secure nature of the blockchain makes it quite useful for *accounting and auditing* as it significantly reduces the possibility of human error and enables record integrity. In addition to this, no one can change account records once they are locked using blockchain technology, not even the record holders. This way, blockchain could eventually eliminate the need for auditors.

## **2.2. Healthcare**

Blockchain contributes vastly to the healthcare sector [12]. Healthcare is the field that can implement blockchain technology the most in the future. Blockchain as a supply chain business model can be applied to the entire healthcare value chain. This technology is improving and transforming everything from medical records and payments to analytics and processing,

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<sup>35</sup> <https://www.insiderintelligence.com/insights/blockchain-technology-applications-use-cases/>, accessed on 16<sup>th</sup> October, 2023

<sup>36</sup> <https://www.insiderintelligence.com/insights/blockchain-technology-applications-use-cases/>, accessed on 16<sup>th</sup> October, 2023

and benefits all stakeholders, from patients and customers to administrators and healthcare institutions.

The possibilities for using blockchain technology in healthcare seems endless. Health data suitable for the application of blockchain technology includes general information such as gender, age, blood type and potential medical history data such as immunization history. None of this information could be linked to an individual patient, which could allow this data to be stored without the risk of compromising privacy. As well, given that specialized connected medical devices are increasingly in use and increasingly linked to a person's health record, blockchain can be used to link those devices to that record.

Finally, a few of the most common applications of blockchain technology in healthcare can be listed as: secure electronic health records (EHRs); clinical trial research, pharmaceutical supply chain management, verification of staff credentials and remote patient monitoring.<sup>37</sup> One of the more significant applications of blockchain in healthcare is the registration and monitoring of vaccinations during the COVID pandemic [12].

### ***2.3. Real Estate and Internet of Things (IoT)***

Blockchain technology has the power to impact the real estate trading. Blockchain technology helps in the development of smart contracts, which allow the signing of real estate contracts, escrow and property records without the involvement of a third party. In the future, it will likely be possible for a buyer to purchase a home and complete the sale on a website. This technology can ensure that the buyer gets ownership of the property and the seller is paid via cryptocurrency. Money and transaction management is constantly changing and that change is already underway. Real estate agents need to adapt their business models to implement smart transactions and thrive in blockchain adoption.

Regarding to blockchaing applications in IoT, this technology enables all IoT devices to improve security and transparency in their ecosystems. One of the most significant examples of blockchain application in IoT is related to smart homes. Given the fact that IoT enables remote control of home security systems via smartphone, the traditional centralized approach to sharing information collected by IoT devices lacks security standards and information ownership. Also, blockchain technology has the power to advance the smart home model to a high level by using new security models and removing centralized infrastructure. One of the great examples of

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<sup>37</sup> <https://learn.g2.com/blockchain-applications>, accessed on 15<sup>th</sup> October, 2023

blockchain application through smart home solutions is the Australian company Telstra. This company implements blockchain and biometric security to ensure that the data collected from smart devices cannot be changed.<sup>38</sup>

Finally, the Internet of Things makes our daily lives easier, but also opens the door for bad actors to access our data or take control of important systems. Blockchain can provide greater security by storing passwords and other data on a decentralized network instead of a centralized server. In addition, it also offers protection against unauthorized access to data.

#### ***2.4. Supply Chain Management***

By delivering full visibility into the supply chain, blockchain technology enables all network participants to monitor what is happening in the system at any time. Blockchain technology represents a novel information system and consensus formation mechanism that can intermediate the behavior of a supply chain network [1].

The use of blockchain technology enables several new options for companies that transport goods. Blockchain entries can be useful for queuing events with the supply chain - allocating goods that have just arrived at a port to different shipping containers, for example. Blockchain technology provides a new and dynamic model for organizing tracking data and using it. Companies involved in the supply chain using blockchain technology can benefit significantly from transparency, data confidentiality and an immutable record of various transactions. As one good example in application of blockchain technology, Ethereum will be applied to tokenize the shipping industry.<sup>39</sup>

#### ***2.5. Government***

There are many examples of the application of blockchain technology in government agencies. Local and national governments are responsible for maintaining citizens' data such as date of birth, date of death, marital status or property transfer. Sometimes it's really frustrating for citizens to manipulate that data in paper form and it sometimes significantly complicates and delays administrative activities. The application of blockchain technologies can simplify the storage, maintenance and security

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<sup>38</sup> <https://intellipaat.com/blog/tutorial/blockchain-tutorial/blockchain-applications/>, accessed on 16<sup>th</sup> October, 2023

<sup>39</sup> <https://intellipaat.com/blog/tutorial/blockchain-tutorial/blockchain-applications/>, accessed on 16<sup>th</sup> October, 2023

of this data. The principal mechanism of blockchain governance is Decentralised Autonomous Organisations (DAOs) [11].

One of the most important applications of blockchain technology in government is the use of digital identities stored on the blockchain to administer government benefits, such as the Social Security program. Using blockchain technology can reduce fraud and the cost of operations. On the other hand, the time of payment to users of services is shortened by using digital payment. Also, in recent times, the idea of introducing a national digital currency based on the application of blockchain technology has been present in an increasing number of countries. Some of them have already started with the experimental application of this idea. Finally, some other uses of blockchain technology in government are records management, identity management, taxes and others. One of the significant applications of blockchain from the government side can be voting, which is explained in a separate section.

### ***2.6. Cybersecurity***

One of the biggest benefits of using blockchain in cybersecurity is that it removes the risk of a single point of failure. Blockchain technology also provides overall encryption and privacy. Due to the fact that many organizations are becoming increasingly dependent on the Internet and technology to generate revenue streams and articulate business models, the scope of hackers exploiting businesses has increased exponentially. In general, the need for effective cyber security solutions is at an all-time high.<sup>40</sup> With application of distributed ledger technology, blockchains can significantly improve cyber defenses.

The application of Blockchain platforms can prevent fraudulent activities through consensus mechanisms and detect unauthorized changes in data depending on the basic characteristics of operational resilience, data encryption, auditability, transparency and immutability.

### ***2.7. Social Media***

The entry of blockchain technology into the social media space has created a revolution. Technology has advanced social media platforms and taken them to a higher level. Thanks to its decentralized and distributed ledger structure, blockchain technology enables the use of a methodology that enables greater control over the privacy of personal data and at the same time potential

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<sup>40</sup> <https://intellipaat.com/blog/tutorial/blockchain-tutorial/blockchain-applications/>, accessed on 16<sup>th</sup> October, 2023

earnings and monetary compensation for viral content that is shared through social media.<sup>41</sup>

Blockchain technology has been employed in various ways to anonymize user data [7]. The application of blockchain technology in social media allows content and information to be privately distributed and managed in a monetized manner.

### ***2.8. Artificial Intelligence***

Artificial Intelligence on top of blockchains can be potentially one of the most powerful and dangerous technologies that were ever created. If we were to decentralize AI, AI algorithms could become Decentralized Autonomous Organizations (DAO).<sup>42</sup> When conducted optimally, an AI DAO could take over development at same point by learning through data to optimize itself much more effectively than could be done through human designs. Together blockchains and AI, can drive new possibilities in the realms of data protection, data monetization and smart algorithms.

### ***2.9. Media and Entertainment***

The media and entertainment represent a big field for use of blockchain technology, and applications are as imaginative as the industry itself.<sup>43</sup> Companies in the media industry have already begun to significantly leverage blockchain technology to eliminate fraud, reduce costs, and protect intellectual property rights to content such as music records. According to MarketWatch, the global market for blockchain in media and entertainment is estimated to reach 1,54 billion of dollars by 2024.<sup>44</sup>

While this industry is yet to utilize the full potential of blockchain technology, the technology supports artists and content creators get their dues, both in terms of revenue and copyrights.

### ***2.10. Secure personal information***

It is evident that keeping data such as social security number, date of birth and other identifying information on a public ledger may actually be more secure than existing systems, which are more accessible to hacking.

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<sup>41</sup> <https://intellipaat.com/blog/tutorial/blockchain-tutorial/blockchain-applications/>, accessed on 16<sup>th</sup> October, 2023

<sup>42</sup> <https://intellipaat.com/blog/tutorial/blockchain-tutorial/blockchain-applications/>, accessed on 16<sup>th</sup> October, 2023

<sup>43</sup> <https://www.techtarget.com/searchcio/feature/Todays-blockchain-use-cases-and-industry-applications>, accessed on 16<sup>th</sup> October, 2023

<sup>44</sup> <https://www.insiderintelligence.com/insights/blockchain-technology-applications-use-cases/>, accessed on 16<sup>th</sup> October, 2023

Blockchain technology can be used to provide access to identifying information in industries such as healthcare, finance or government, as it provides better data protection. This is a very important aspect of the modern development of society and economy.

### ***2.11. Voting***

As already mentioned when discussing the impact of blockchain technology on government, voting is presented in a separate section. If identity information is stored on the blockchain, it means that we are one step away from being able to vote in elections using blockchain technology. By applying blockchain technology, it is possible for each voter to vote only once, only those who have the right to vote, and for the votes to be counted correctly. Access to voting would be much simpler, as a citizen could use the right to vote by pressing a few buttons on a smartphone. At the same time, the application of blockchain technology reduces the costs of holding elections.

### ***2.12. Smart contracts***

Smart contract software is built on blockchain-based platforms that automate the execution of contracts, removing the need for intermediaries. These contracts allow confidential transactions and agreements between two parties without a central authority. Smart contracts have several uses, including real estate, finance, healthcare, supply chain, etc. Thus, the primary function of these programs is to automate the execution of contract terms when certain conditions are met. Blockchain keeps a permanent record of every action related to a transaction. One of the best examples of blockchain technology in smart contracts is product of company DFINITY from San Francisco, California. Its Internet Computer, an open-source blockchain network, users can build decentralized applications and Web3 services directly on-chain. The Internet Computer offers scalable smart contracts and low-latency consensus, which supports Bitcoin network integration, as well as decentralized social media applications.<sup>45</sup>

## **CONCLUSION**

Based on what was presented in the paper, the characteristics of blockchain technology and their impact on the application of this technology can be clearly seen. After all, the importance of such characteristics of blockchain technology can be seen through the aforementioned applications of

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<sup>45</sup> <https://builtin.com/blockchain/blockchain-applications>, accessed on 17<sup>th</sup> October, 2023

blockchain technology. If we look at the spectrum of possible applications of blockchain technology, it is easy for us to conclude that there is almost no area of human activity in which the use of blockchain technology cannot achieve some progress. Innovations brought by blockchain technology undoubtedly contribute to the general development of the economy and society. The time required for the application of blockchain technology in various economic and social fields may determine the level of development of our civilization in the near future.

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## THE POSSIBILITIES OF USING DOMAIN ONTOLOGIES IN INFORMATION SCIENCE FOR THE DEVELOPMENT OF ACCOUNTING

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**Abstract:** *The purpose of the work is to reveal the possibilities of domain ontologies in information technologies that could contribute to the development of accounting theory and methodology. The current state of ontologies in information technologies is considered. The main approaches to the construction of ontologies are studied. The REA model ("Resources", "Events", "Agents") developed by William McCarthy in 1982 is considered. The REA William McCarthy model is able to claim the role of accounting information ontologies. It is noted that, despite the high potential, ontologies have not met expectations and interest in them is declining. The hypothesis is put forward that the reason for the decline in interest in ontologies is that they do not sufficiently elaborate the category of "events" as the main unit for constructing ontologies. The author's ontological model of an event as a change in the values of observed attributes (OMECVA) is described. According to OMECVA, the information reflection of objects is considered as a cluster of attributes and the meanings of these attributes. Information about economic processes is made up of event records corresponding to OMECVA. It is shown that the double entry of accounting is a special case of OMECVA. Based on OMECVA, a model of accounting in a multidimensional data environment OLAP (multidimensional accounting (MDA) is shown. It is shown that the ontological model of accounting concretizes and formalizes accounting terms. This applies to accounting accounts, accounting transactions, debit, credit, balance sheet. Several unexpected conclusions were obtained. For example, according to OMECVA, a credit in a double entry reflects the completed state of economic relations as a result of an event, and a debit means the state of economic relations that has occurred as a result of an event. In this case, the sequence should be as follows: Credit – Debit for the accounting record. Also, in accordance with the time flow, the balance structure looks more accurate, where the Liability is on the left and the*

*Asset is on the right. The features and advantages of the MDA model for organizing a system for informing users of accounting information are studied.*

**Keywords:** *Accounting, event, economic process, ontology, multidimensional accounting*

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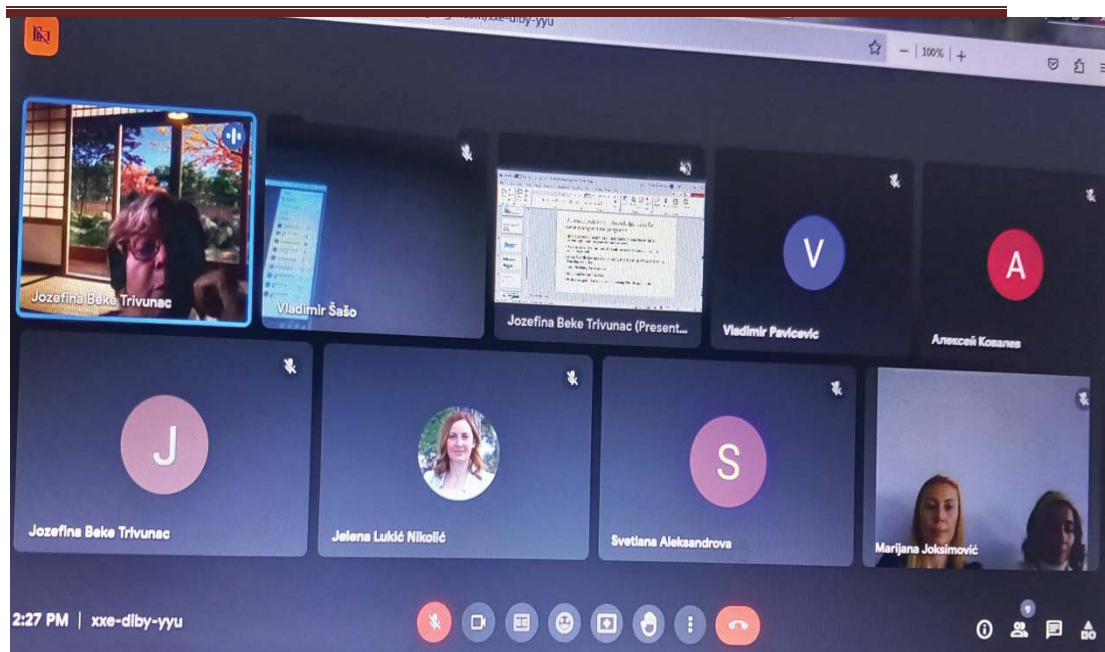


*Opening of the Conference*



*Greeting speech*

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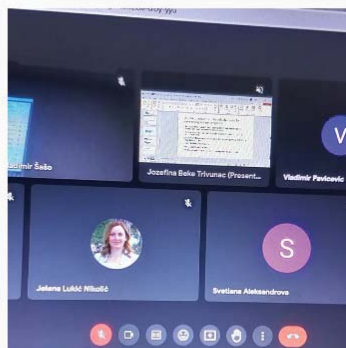


*Online presentation of Conference participants*



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*Ambience at the Conference*

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