

# ARTIFICIAL INTELLIGENCE AND DIGITAL TRANSFORMATION IN THE FUNCTION OF BUSINESS

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**Abstract:** This paper will present the latest research from the current field of mass application of artificial intelligence and Industry 4.0, through the prism of the impact on digital transformation and digital competencies of key users in business. Based on the research of representative foreign and domestic scientific literature, the theoretical foundations of artificial intelligence, digital transformation, and defined digital competence necessary for the age of the information society will evolve. The paper will present concrete cases of the effects of artificial intelligence on application in business through the impact on certain areas of life and work with examples from neighboring countries. This research study defines the concept, highlights the evolution and development of artificial intelligence, digitization process, and digital transformation, through an overview of their key technologies that identifies the role of artificial intelligence as the backbone of digital transformation, explores the trends of the digitization process, highlights key challenges and explores its applications in business and industry 4.0 in European countries with the identification of the impact on everyday life, and the evolution of current trends and challenges.

**Keywords:** artificial intelligence, digital transformations, competences, business

## **1. Introduction**

Modern technological processes represent a chance to modernize business and industry through the use of the latest technologies such as artificial intelligence, the Internet of Things, and cloud computing services. Modern sophisticated technologies allow us to automate jobs and make everyday tasks easier, we do things simultaneously, quickly and efficiently (Denić N et all 2023a). In this sense, some authors point out that the technological revolution can enable businesses with competitive advantages that can lead to many potential benefits (Mosconi, Packmohr & Antonio De Santa-Eulalia, 2019). One of the key innovations in this sense is the Internet, as the fundamental technology and engine of digitization, which is undergoing transformation and in the final phase of digitization will be transformed into a new form of IoT (Elemić & Manojlović, 2022). However, some authors such as Weitzman (2016) emphasize that in the flood of technological innovations, people must be selective and carefully study which technology is necessary for us and how much value it brings us.

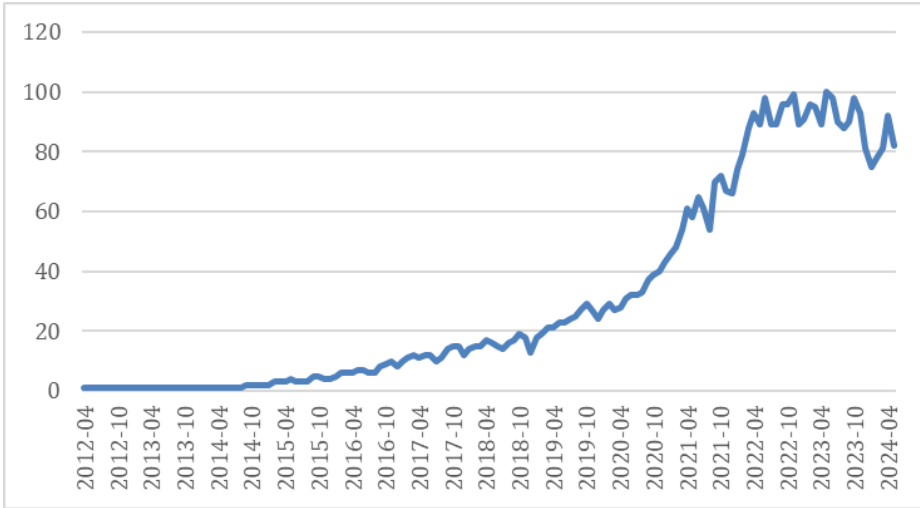
In this direction, the authors Brennen and Kreiss (2014) define digitization as the process of converting

an analog signal into a digital signal using a binary format. The theoretical background of this phenomenon encompasses various aspects, including information technology, the Internet of Things, artificial intelligence, data processing, and machine learning. (Atwell, et al. 2019). Digitization is a process that involves the introduction of digital technology into organizations, businesses, and organizations in everyday life (Brennen & Kreiss, 2014). In addition to the above definitions, the study presented by Fichman, Dos Santos, and Zheng (2014) is often mentioned in the literature, which defines digitalization as a process that transforms content or objects that were originally completely physical or analog into digital ones. In general, it can be said that the term digitization is most often used when different forms of information, such as text, sound, image, or voice, are converted into binary code. In the binary code, information exists in digital form as one of two digits, 0 or 1. The information defined in this way is also known as a bit (digits in the binary number system - base 2 system) where sequences of digits 0 and 1 constitute information called a byte (Copestake, et al., 2024). One of the fundamental goals of the digitization process is to improve efficiency, speed, and reliability in every

activity, using digital technology. The following Figure 1 shows the search trend for the term digital transformation on Google by year.

optimal business decisions (Ma, 2024). Another advantage mentioned by the author is that customers and markets that were previously

**Figure 1.** Digital transformation of Google searches over the years



*Source: Google trends*

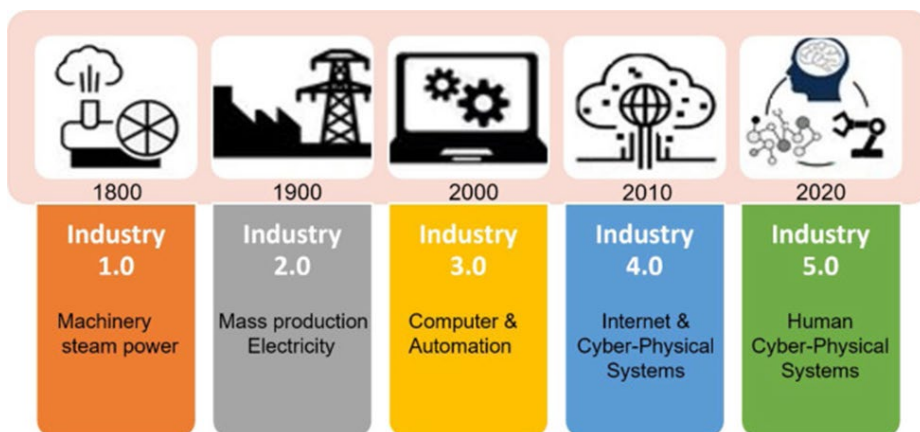
One of the main benefits of the digitization process is the increase in the efficiency of business processes, which at the same time become more flexible (Denić N et al 2020). In addition to the above advantages, digitalization can save on costs and increase operational efficiency by automating daily operations and simplifying the company's business processes. The latest research indicates that the processes of data collection and analysis in real-time can also be enabled by digitalization, which enables companies to make

inaccessible due to geographical, cultural, or economic limitations can now be reached through the application of digital technologies (Ma, 2024). In this context, key elements of these processes include artificial intelligence that allows machines to learn and adapt, the Internet of Things that connects devices and systems, and cloud technologies that allow access to data from anywhere in the world (Atwell, et. al. 2019). In the literature, there are several interesting opinions about the digitalization process, where it is

stated that at the company level, Kuusisto (2017, p. 341) defines digitalization as the use of digital means by which the organization can improve its operations. By introducing the digitalization process in business, we improve efficiency and effectiveness, while creating new added value for customers (Denić et al 2018). On the other hand, despite the fact that digitization represents

They are still not in line with the importance of the mentioned process. Overall, the theoretical background of digitization and Industry 4.0 encompasses a wide range of different concepts and interpretations. In the following Figure 2, a characteristic chronological development or evolution of the industry is presented.

**Figure. 2.** Industrial evolution



*Source: (Sharmin et al 2024)*

an important factor for the application of innovations in the current scientific research fund, research on these processes, that is, on how digitization, innovations, and information and communication technologies contribute to the performance of open innovations in banking (Copestake, et al., 2024).

It is obvious that the accelerated technological development, the expansion of smart devices, and the proliferation of mobile devices, as some of the elements of the fourth industrial revolution, have placed especially before financial institutions' challenges to which they have responded by digitalization, the creation of new communication cha-

nnels to clients, as well as a multitude of other innovative services (Copestake, et al., 2024). One of the innovations that is often mentioned in the literature is Industry 4.0, which especially affects manufacturers because a large number of new technological innovations can be applied in production, storage, operations, manipulation, and the like. (Vendrell-Herrero, et al., 2024). Theoretical research indicates that Industry 4.0 logically follows the previous three industrial revolutions and marks the rapid digital transformation of processes within the manufacturing and manufacturing (and other related) industries. (Atwell, et al. 2019). In this context, Transformation is based on the intelligent networking of machines (and other devices) using advanced information and communication technologies, with the aim of enabling autonomous communication between devices, analysis and collection of large amounts of data, autonomous decision-making, monitoring of the situation in realtime, assets and processes and the creation of additional values (Gartner, 2021). The transformation of business models as part of Industry 4.0 results in improvements that lead to increased profits, reduced costs, improved user experience, innovation, etc. (Gartner, 2021). Some authors

emphasize that the fourth industrial revolution represents a transition to a "higher level" of production in which machines will be completely redefined in terms of communication methods and individual functions (Đorđević, 2020). However, some authors emphasize the importance of the quality management process through the question of what is this more knowledge what is this more advanced approach, and what should be understood, the answers to these questions should be sought by resolving the causes of the insufficiently efficient process of automation and digitization in the current application, from the aspect of principles and approach to quality management. (Muller, et al., 2023).

## **2. Digital transformation**

In the relevant literature, it is emphasized that the term digital transformation expresses the totality of actions that an organization must undertake when it comes to the introduction of new technologies (Singh and Hess, 2017, p. 2). Some authors point out that digital transformation as a term represents a new phenomenon in the business sector, although based on practical experience, most companies are still not ready to tackle it (Mosconi, Pack-

mohr & Antonio De Santa-Eulalia, 2019). In essence, digital transformation represents much more than just the application of new technologies. In this context, some authors emphasize that it includes all processes within the company that include both technology and employees (Del Rove, 2017). In the process of digital transformation, using sophisticated digital technology (social networks, mobile applications, analytics, etc.), the company introduces continuous business improvements that improve user experience, and information flow or create new business models. The well-known author Vielle (2016, p. 11) defines digital transformation as a process that includes: constant development,

implementation, and maintenance of information technology. This is followed by experts who emphasize that it involves a strategy at the company level, which includes all the opportunities and risks that digital technology brings with it (Singh and Hess, 2017, p. 2). The digital transformation of the business economy can be defined as a global change in the economic system, characterized by the transfer of all economic relations in the virtual world (Alekseevna, Iakovlevna and Vasilievich, 2017, pp. 2-3). Well-known authors Morakanyana, Grace & O'Reilly, (2017) in Table 1, presented the characteristics of the digital transformation process.

**Table 1.** Digital transformation and its characteristics

What is digital transformation?	
Organizational strategy	(Bharadwaj, Omar, Pavlou & Venkatraman, 2013) (Matt, Hess & Benlian, 2015)
Business processes	(Agarwal, Gao, Desroches & Jha, 2010) (Berman & Marshall, 2014)
Paradigms	(Berman & Marshall, 2014)
What are the characteristics of digital transformation?	
Radical	(Westerman, Calmédjane, Bonnet, Ferraris & McAfee, 2011) (Berman & Marshall, 2014) (Berman, 2012)
Disruptive	(Fitzgerald, Kruschwitz, Bonnet & Welch, 2014) (Berman, 2012)
Evolutionary	(Loebbecke & Picot, 2015)
Complex	(Matt, Hess & Benlian, 2015)

*Source: (Morakanyane, Grace & O'Reilly, 2017)*

Digital transformation has the greatest impact on businesses in terms of winning new potential customers and acquiring the resources they use (Tolboom, 2016). In their study, some authors emphasize that considering the impact of digital transformation, the International Data Corporation (IDC) estimated that the amount of investment in IT projects or digital transformation technologies in 2017 was greater than 1.7 trillion dollars (Gale & Aarons, 2018). Therefore, in today's digital age, the concept of digital transformation has attracted a lot of attention and has become a daily agenda item for business leaders (Morakaniane, Grace & O'Reilli, 2017). Some authors emphasize the importance of innovations in the digitization process. In this context, Weitzman (2016, p. 196) claims that innovation is the ultimate measure of progress. The same author emphasizes that the speed of innovation depends on effectiveness, productivity, and efficiency. Digital transformation also has a strong impact on human resources, as it fundamentally changes the management and organizational structure of the company. The application of the new concept creates new jobs and a large number of existing organizational functions will be automated or replaced by robots. As a result of all that, the conclusion is that business

is increasingly dependent on the application of information technology. In this context, it is pointed out that revolutionary changes in business efficiency are taking place in terms of speed, efficiency, reliability, and quality (Ahlemann, 2016).

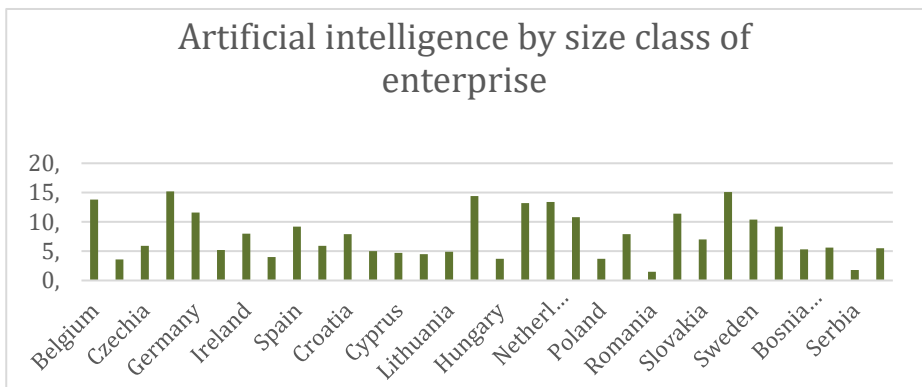
### **3. Artificial intelligence IoT paradigm and application**

The relevant literature has offered various definitions of artificial intelligence, each of which encompasses key concepts of non-human intelligence programmed to perform specific tasks (Dwivedi et al. 2021). Some of the current emerging technologies are the Internet of Things, Big Data, Big Data Blocks, Social Networks, Artificial Intelligence), Virtual Reality, Augmented Reality, 3D Printing, etc. (Vielle, 2016, p. 9). The emergence of Internet browsers and Internet technologies continued the trend of faster, better, and cheaper systems, which allow us to use open-source software and standards, which further increases the scope and impact of computing (Elemić & Manojlović, 2022). One of the most current leading modern technologies is artificial intelligence. The possibilities of application as well as the benefits that its application brings are enormous. In this sense, the

literature states that artificial intelligence initiates major changes in all spheres of society, business, politics, education, human resources, finance, etc. (Kaal and Vermeulen, 2017, p. 179). The mentioned authors further state that the artificial intelligence of standard computer algorithms differs in that it is an imitation of the human mind through self-learning and based on past experience (Kaal and Vermeulen, 2017, p. 179). Common to the existing definitions of artificial intelligence is the increasing ability of machines to perform specific roles and tasks currently performed by humans in the workplace and society in general (Dwivedi et al. 2021).

when he summarized the findings of the Stanford University research, which, among other things, examines how artificial intelligence and smart technologies will affect life in 2030. Examples in practice indicate that artificial intelligence encourages progress in all areas of life and work in the economy, health, and education and that it will radically change the way of life and work. For the above reasons, companies today are pursuing artificial intelligence to automate business processes, improve customer care, improve operations and cyber security. The following figure 3 shows the representation of artificial intelligence in companies of different European countries.

**Figure 3.** Artificial intelligence by size class of enterprise (Eurostat)



*Source: Eurostat - Artificial intelligence by company size*

Many research studies and expertise deal with this topic, one of them was conducted by Stackpole (2016, p. 29)

Figure 3 shows that certain countries such as Finland, Denmark, Luxembourg, etc. have advanced far in



the application of artificial intelligence in companies and that the benefits of application are noticeable in almost all areas. Based on the Report from 2019, the Republic of Serbia was ranked 58th out of 194 countries. The index measures eleven indicators grouped into four areas: governance, infrastructure and data, skills and education, and public administration and services. Starting with current applications in business automation, education, and machine learning, for example in healthcare smart sensors will help in measuring and collecting data on patients, diagnoses, and life expectancy. The current crisis with the COVID-19 pandemic has led overnight to the massive application of modern learning tools, even though scientists have long since devised electronic learning tools and worked hard to ensure that the computer could replace humans with machine learning. In the relevant literature, machine learning is defined as solving problems using algorithms that learn from examples, data, and experience (Godrej, 2017, p. 13). The same author cites the latest report by Citi and Oxford Martins School, according to which more than 80% of retail jobs are being automated. Also according to this author, it is predicted that one in three jobs in Great Britain should be abolished

over time (Godrej, 2017, p. 13). One of the consequences of the application of modern technologies is that automation itself will reduce outsourcing because companies will again be able to produce cheaply in their environment (Godrej, 2017, p. 13). The most optimal application of artificial intelligence from the aspect of humanity, which is confirmed by experience in practice, is the automation of work that is monotonous, boring, repetitive, dirty, and dangerous to the health and life of employees. However, novelties and changes are evident, airplanes can easily deliver the necessary medicines to the most difficult areas in Africa (Godrej, 2017, p. 13). According to the same author, it is estimated that e.g. by 2030, 30% of all police officers in Dubai will be robots (Godrej, 2017, p. 14). One of the technologies that has been relevant for some time is the Internet of Things (IoT), which has a wide application and is present in almost all business processes. Well-known author Stackpole (2016, p. 26) defines IoT as things or processes that we connect to the Internet to ensure better performance and user experience. The development of technology also brings with it security issues, as things connected to the Internet are far more susceptible to abuse (Stackpole, 2016, p. 27). The dilemma is

how to control the devices and the data that is collected about us. Research indicates that the innovative application of modern methods, techniques, and tools of artificial intelligence, which are based on or are connected to the application of deep neural networks and accompanying scientific and technological achievements, is underrepresented. Godrej (2017, p. 16) highlights the problem of control over technology and the accumulation of data primarily at the level of individuals, which in turn will have a major impact on society as a whole. However, without a legal identity, AI cannot be held responsible for its actions and resulting damages (Kaal and Vermeulen, 2017, p. 181). For effective quality 4.0 in business, it is necessary to observe that: quality is an attitude; quality is a process of change that allows the organization to learn about the wishes and needs of users, whether they are expressed or not; quality is a framework for improvement, a way of life, culture and thinking, that is, understanding. (Tjahjono, et al. 2023). There is still a public fear of the term artificial intelligence in the sense that the technological elite could manage the lives and property of individuals.

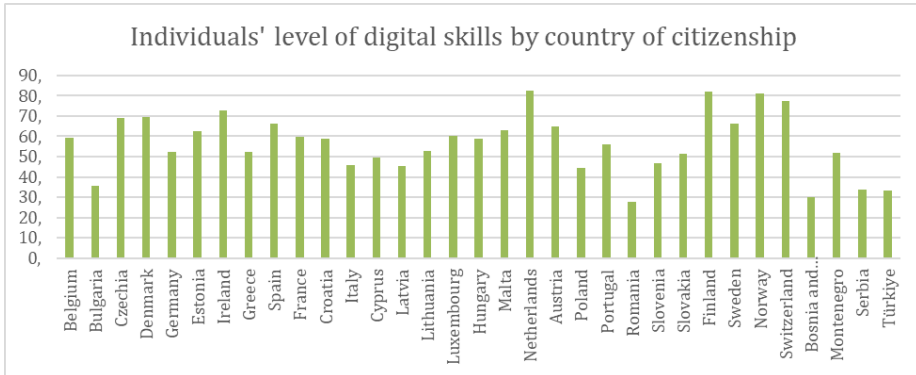
#### **4. Effects of artificial intelligence on digital competences**

Modern society has become tied to technology in all spheres of human life (Denić 2019). Digital transformation requires special competencies, which are very rare in the human resources market today (Ahlemann, 2016). In the relevant literature, there is an interpretation of artificial intelligence as an institutional hybrid, i.e. a term that is quite problematic and that needs to be reinterpreted by the needs of different actors (lawyers understand artificial intelligence in a different way than policymakers, in a different way than journalists, different from bioinformatics experts, different from science fiction fans, etc.) (Dwivedi et al. 2021). A good number of scientists, cyberneticians, systems theorists, artificial intelligence/robotics experts, and sociologists argue that artificial intelligence is simply undefinable because we do not have a clear understanding of the word intelligence (Dwivedi et al. 2021). The fact is that artificial intelligence requires a good knowledge of information technologies, i.e. raising digital competencies to a higher level. Fundamental digital competencies, in the long run, are generated in the education system, and the level of digital competencies of

students depends, among other things, on the level of digital competencies of lecturers. In this sense, artificial intelligence is highlighted as a special cross-curricular competence within the Standard of General Cross-Curricular Competences for the end of secondary education. The above does not mean only the ability of citizens to read digital content or to use a computer at an elementary level, but a broader knowledge of IT. Research indicates that there is significant room for improvement and education of the population in

Intelligence showed that the public in the Republic of Serbia has mostly heard of the concept of artificial intelligence, but that 4% of respondents do not know anything about artificial intelligence, while 8% know quite a bit, and that 40% are somewhat familiar with it. concept and its application. Digital competence, where it is necessary to determine the role of artificial intelligence in cross-curricular competencies. The following figure 4 presents the level of digital skills of individuals in different European countries.

**Figure 4.** Individuals' level of digital skills by country of citizenship



*Source: Eurostat - Level of digital skills of individuals by country of citizenship*

this segment because even the use of artificial intelligence implies that citizens know how to recognize when they are interacting with it (for example, when assistance is provided by a virtual assistant, not a human). The conducted survey Public Attitudes on the Use of Artificial

## 5. Conclusion

Digital transformation is undoubtedly one of the main topics in business development today. Almost all innovations are related to the digital perception of the world, and the change of business models towards

digitalization is essential for the survival of companies. What experiences in the world show is that to fully fulfill the potential of digitization and Industry 4.0, Serbia must invest in the education and training of its citizens to work with new technologies. Incorporating more sophisticated technologies such as artificial intelligence (AI) and machine learning (ML) can increase business efficiency and effectiveness through business process automation. In this sense, the state must invest more in initiatives to raise public awareness and education to develop the competencies of all citizens, especially the younger generations, to better understand the implications of AI. Also, it is necessary to create a stimulating environment for innovation and the development of new technologies. In the Strategy for the Development of Artificial Intelligence in the Republic of Serbia for the Period 2020-2025. it is recommended to educate experts and improve the situation in the Republic of Serbia when it comes to professional staff for the development and application of artificial intelligence. The main purpose of this research is a favorable starting point for the successful implementation of digital transformation, which in turn has a positive impact on companies' operations. As the digital revolution

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progresses, these transformations will fundamentally change the information and decision-making systems we use to design, manage, and control business processes. Despite significant progress in the field of digital transformations, much remains undiscovered. Integrating advanced technologies can improve the predictive and analytical capabilities of modern technologies. As these sophisticated technologies mature, research should explore their adaptability in various production systems and critical data security and privacy issues. In this sense, directions for further progress are being imposed, the first is towards raising digital competencies, i.e. educating the wider public in the Republic of Serbia, and towards increasing the transparency of the benefits of the application of artificial intelligence, while the second direction of action should be to investigate ethical and humane aspects of the application of sophisticated technologies such as artificial intelligence at an expert level with all the implications of the risks and challenges that they bring with them.

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## **VEŠTAČKA INTELIGENCIJA I DIGITALNA TRANSFORMACIJA U FUNKCIJI POSLOVANJA**

**Rezime:** U ovom radu biće predstavljena najnovija istraživanja iz aktuelne oblasti masovne primene veštačke inteligencije i Industrije 4.0, kroz prizmu uticaja na digitalnu transformaciju i digitalne kompetencije ključnih korisnika u poslovanju. Na osnovu istraživanja reprezentativne inostrane i domaće naučne literature, razvijaće se teorijske osnove veštačke inteligencije, digitalne transformacije i definisane digitalne kompetencije neophodne za doba informacionog društva. U radu će biti prikazani konkretni slučajevi uticaja veštačke inteligencije na primenu u poslovanju kroz uticaj na pojedine oblasti života i rada na primerima iz zemalja u okruženju. Ova istraživačka studija definiše koncept, ističe evoluciju i razvoj veštačke inteligencije, proces digitalizacije i digitalnu transformaciju, kroz pregled njihovih ključnih tehnologija koja identifikuje ulogu veštačke inteligencije kao okosnice digitalne transformacije, istražuje trendove procesa digitalizacije, ističe ključne izazove i istražuje njegove primene u poslovanju i industriji 4.0 u evropskim zemljama uz identifikaciju uticaja na svakodnevni život i evoluciju trenutnih trendova i izazova.

**Ključne reči:** veštačka inteligencija, digitalne transformacije, kompetencije, poslovanje