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BUSINESS DIGITIZATION IN WESTERN BALKAN COUNTRIES: TRENDS, GAPS AND CONVERGENCE WITH THE EU

Jelena Živković[1] *, Stefan Zdravković[2]

[1] *University of Kragujevac, Institute for Information Technologies Kragujevac, Serbia*
[2] *University MB, Faculty of Business and Law, Serbia*

Abstract: Digitization is one of the essential factor for economy prosperity in modern world. Increasingly rapid changes in technology contribute to the fact that digitization is becoming a condition for achieving better position on market for both companies and national economies. Digitization consists of the application of various technologies in everyday business. This is especially challenging for developing countries, including the countries of the Western Balkans. Paper analyses the level of business digitization in Western Balkans measured like dimension of DESI from 2020 to 2023. The results show that Western Balkan countries improved their business digitization indicators. However, indicators present that there is adoption of basic digital technology, while the application of more advanced technology is delayed. There are differences between individual economies in this region mostly due to different regulation frameworks. Nevertheless, the countries of this region have made progress in most of the analysed indicators. There is a lag between WB countries and EU member states especially in adoption of advanced digital tools. Therefore, greater investments in infrastructure and incentives for companies to apply these tools with appropriate legal regulations are needed.

Keywords: digitization, DESI, Western Balkans

1. INTRODUCTION

Digitization is an important part of the modern world and society. Digital transformation implies the adoption of digital technologies, such as cloud, data analytics, artificial intelligence and digital communication tools, into business processes. In this way, businesses can improve efficiency, innovation and adaptability to the market changes. This is not the case with only existing activities, but include structural changes. Digital transformation is especially important in developing and transition countries, where it can be a great opportunity for accelerating development and reducing the gap with more developed countries. However, the dynamics and scope of this process can be different between countries, especially between Western Balkan

* *Corresponding author: jelenazivkovic@uni.kg.ac.rs*

Jelena Živković, ORCID: 0000-0002-8670-4249
Stefan Zdravković, ORCID: 0000-0002-0047-3356

countries and EU member states. The difference depends on the infrastructure, regulatory framework and the level of technological readiness.

The European Commission calculated the DESI index for member states from 2014. The methodology is harmonised for Western Balkan countries in 2022, so that indicators can be compared. In these circumstances, monitoring the adoption of digital innovations in both EU member states and candidate countries is facilitated. The paper aims to inspect the level of digital transformation in the Western Balkan countries with the intention of identifying the areas in which these countries are successful and in which they lag behind EU member states. The object of the research is the digital transformation in business, measured by DESI. By applying this index, it is possible to clearly comprehend whether the countries of the Western Balkans have opportunities for more massive application of high technologies and digital tools. In accordance with the defined research objective and subject, the study is based on the following hypotheses:

H1: Western Balkan countries have a significantly lower level of business digitalisation compared to EU countries.

H2: The gap between Western Balkan and EU countries is smaller for basic digital technologies than for advanced digital technologies.

The paper consists of several interconnected sections. After the introduction, the first section is dedicated to the theoretical background and studies which analysed the level of digital transformation. In the second part methodology of DESI and the variables which are covered in the research are explained. The digital transformation in Western Balkan countries is elaborated in detail in the third part of the paper. At the same time, a comparison was made in the achieved degree of digital transformation of the countries of the Western Balkans and the EU member states. In the final part of the paper, the main findings and conclusions will be presented.

2. LITERATURE REVIEW

Digitalisation is one of the key drivers of modern economic development, enabling improved efficiency, innovation and competitiveness at the level of individual companies and entire economies. Through the application of digital technologies, such as business process automation, data analysis and the development of digital platforms, companies can optimise their operations and better respond to market demands. In the Western Balkan countries, the digitalisation process is ongoing and is characterised by the gradual adoption of digital solutions, with certain challenges such as insufficient infrastructure, regulatory constraints and digital skills. However, companies are increasingly recognising the importance of digital transformation for improving business operations (Oliveira et al., 2021), increasing productivity and integrating into broader regional and global trends.

Digital transformation in business is increasingly recognised as a crucial component of global economic expansion and competitiveness (Dabbous et al., 2023). As the term "digitization" has become increasingly common in the latest trends in economic and business research, it should also be taken into account that today it is not a miracle that companies can suddenly increase their productivity or efficiency; rather, it is a catalyst for the growth of companies, their competitiveness and greater engagement in achieving their internationalization goals (Vadana et al., 2020). The unprecedented wave of digitalisation currently driving innovation in the business environment has strongly underscored the need to incorporate the latest and most sustainable digital technologies into business activities. Therefore, it is a priority for business management to use digital tools and instruments in their business strategy and operations, aiming for higher return on investment and greater value

creation, thus ensuring the possibility of sustainable development in this fast-paced economic environment (Legner et al., 2017). Ebert and Duarte (2018) indicate that the primary goal of digital transformation is to apply innovative technology for increasing productivity, creating values and enhancing social well-being. Digital transformation implies profound changes in society brought about by the adoption and integration of digital technologies (Shams et al., 2021).

There is evidence about connection between digital transformation and economic growth. Liu (2022) confirms the direct correlation between higher DESI scores and greater economic outcomes in the EU member states, arguing that countries with well-defined digital policies are better positioned. However, in some less developed EU member states and candidate countries, the penetration of digitisation has slowed down (EC, 2025). Herman and Georgescu (2025) revealed substantial disparities among EU member states. They found out that northern and western countries are leading, while southern and eastern countries are lagging. In the case of EU member countries, for instance, more than half of the members experience notable challenges in meeting the targets stipulated in the "Path to the Digital Decade" until 2030, specifically, the target concerning at least 90% of SMEs becoming digitally intensive (Lafortune & Fuller, 2025).

Bieber et al. (2018) concluded that a 10-per cent increase in the digitisation index is associated with a 0.63 per cent GDP growth in the Balkans, reinforcing that the process of the digital transformation drives economic growth. Consequently, intensifying digital transformation would bring Balkan countries nearer to the EU and other developed countries. If the process of digital transformation is intensified, then the difference between EU countries and developing countries will be reduced. It is also important to note that Western Balkan countries are still lagging behind more advanced post-transition economies, which suggests that there is a need for a stronger policy push to stimulate their convergence process (Broz et al., 2020). Levkov and Kitanovikj (2024) confirmed that EU member states are ahead in terms of basic or above basic overall digital skills on average, but that the degree of digital skills is in correlation with labour productivity and GDP per capita in Western Balkan countries. They measured digital skills using the Digital Skills Indicator 2.0.

3. DATA AND METHODOLOGY

The Digital Economy and Society Index (DESI) collect data from all EU member states and candidates. DESI summarises indicators of digital performance and tracks progress across EU countries. The European Commission has been calculating the DESI index since 2014. The methodology for calculating the DESI index has changed since then, but its essence has remained the same, which is to monitor changes in digital advancement. Also, DESI offers theme chapters that provide an analysis across important digital domains. It is crucial for supporting policy decisions and assisting countries in identifying areas that need to be prioritised.

DESI is a composite index with a three-level structure. It is composed of multiple dimensions, sub-dimensions and indicators covering various aspects of digitisation in the EU. Collecting data was an obligation for all EU members, but the Western Balkan countries were required to use DESI indicators (RCC, 2021, p. 15). Periodically, the DESI framework is modified to take into account the most recent advancements in EU policy and technological progress. The European Commission considerably modified DESI in 2021 to take into consideration two important policy initiatives that will influence the digital transformation in EU Member States in the future: The Recovery and Resilience Facility and the 2030 Digital Decade Compass (EC, 2021). The 2030 Digital Decade Compass is a comprehensive strategy

for the digital transformation of the European Union, aimed at achieving advancements in all specified digital domains like Artificial Intelligence, Cybersecurity, Internet of Things, Big Data, High-Performance Computing, 5G, Software, and Digital Skills (Mitrović et al., 2024, p. 220). From 2022 DESI methodology has been changed for Western Balkans countries according to the DESI for the EU for the first time since this index has been in use (RCC, 2022, p. 12).

Table 1. DESI dimensions and sub-dimensions

Digital skills	Digital Infrastructure	Digital transformation of businesses	Digitalisation of public services
• Internet user skills • Advanced skills and development	• Fixed BB • Mobile BB	• Digital intensity • Digital technologies for business • e-Commerce	• e-Government • e-Health

Among the digital transformation of businesses, some indicators are chosen based on data availability. All indicators are measured in percentage of enterprises (Table 2).

Table 2. Indicators of digital transformation of businesses

Indicator	Description
SMEs with at least basic level of digital intensity	The digital intensity score is based on counting how many out of 12 selected technologies are used by enterprises. A basic level requires usage of at least 4 technologies.
Electronic information sharing	Enterprises that have used an ERP (enterprise resource planning) software package to share information between different functional areas (e.g. accounting, planning, production, marketing)
Social media	Enterprises using two or more of the following social media: social networks, enterprise
Data analytics - former Big Data	Enterprises performing data analytics (internally or externally). Data analytics refers to the use of technologies, techniques or software tools for analysing data to extract patterns, trends and insights to make conclusions, predictions and better decision-making with the aim of improving performance (e.g. increase production, reduce costs). Data may be extracted from the own enterprise data source or from external sources (e.g. suppliers, customers, government).
Cloud	Enterprises are buying sophisticated or intermediate cloud computing services
AI	Enterprises using any AI technology
e-Invoices	Enterprises sending e-invoices, suitable for automated processing
SMEs selling online	SMEs selling online (at least 1% of turnover)
E-commerce turnover	SMEs

4. RESULTS AND DISCUSSION

The Western Balkan countries are lagging behind the EU countries in terms of economic development. However, with the digitization, differences in development between countries are becoming easier to overcome. For the introduction of some digital processes, the initial economic base is not important, while others require additional investments and infrastructure. For this reason, the process of digital transformation in business in this region is being monitored. The Western Balkans DESI 2022 Report indicates that the region exhibits notable disparities in digital development across key domains such as education, connectivity, technology usage, and digital public services. While some WB countries, like Montenegro, Serbia, and Albania, achieved better results than others in certain indicators, the region lags behind EU standards (Boshnjaku, 2025, p. 815).

The Figure 1 shows digital transformation across individual economies. A common pattern in all Western Balkan countries is the best score for SMEs with at least a basic level of digital intensity, while AI is at the lowest level. It suggests that basic digital adoption among SMEs has become relatively widespread. On the other hand, the adoption of more advanced digital technologies remains limited across the region. It is recorded the great increase in SMEs with at least a basic level of digital intensity and Data analytics - former Big Data, in Albania in 2023. Until then, the Data analytics - former Big Data has a very low score, which highlights a late but rapid digital adoption. Additionally, Albania achieved the strongest performance in the Electronic information sharing. It points to relatively good integration of digital processes within business operations. There is a high increase in e-Invoice from 18 points in 2022 to 53.8 points in 2023. Bosnia and Herzegovina has similar results to Albania, except for SMEs with at least a basic level of digital intensity, where the best score was 44.8 in 2022. After that, there is no significant improvement. There was adoption of new technology in this country, but with a following stagnation phase. There are stable indicator values in Montenegro from 2020 to 2023. An exception is Data analytics - former Big Data, which has more than twice as good a result in 2023 compared to 2022. North Macedonia records the lowest performance across all concerned indicators. There was a big jump in Social media in 2021, but it was not for so long, so it quickly returned on previous level. This suggests that the adoption was temporary rather than driven by some structural changes. In Serbia, most of indicator are below 30, except SMEs with at least a basic level of digital intensity, but a decreasing trend was observed in the values of this indicator. There is a great improvement in e-Invoice. Also, there is an increase in Data analytics - former Big Data, which is characteristic of the entire region.

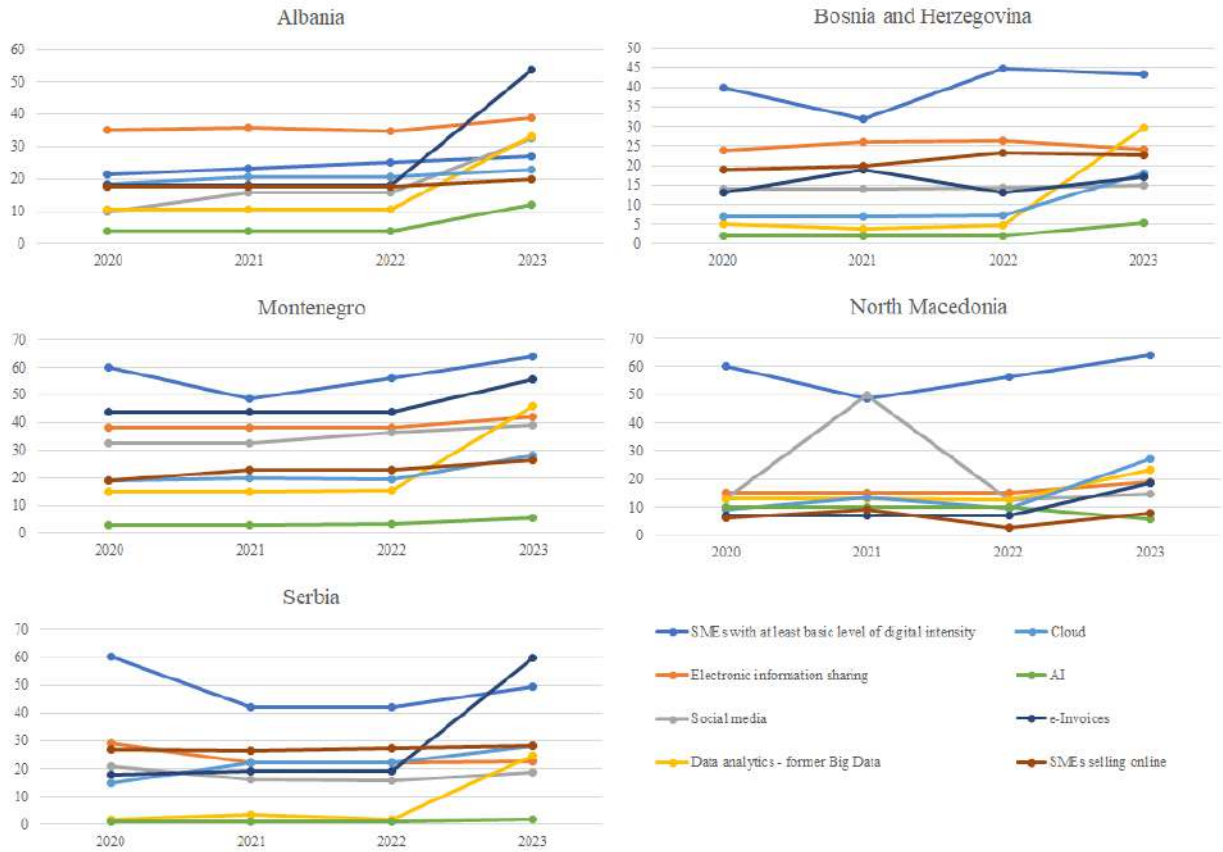


Figure 1. Indicators of the digital transformation of businesses in all Western Balkan countries from 2020 to 2023 (Authors)

The Figure 2 represents the digital profile of Western Balkan countries and differences between individual economies. At the beginning of the observed period, the differences between the countries of the Western Balkans were more noticeable both in terms of time and regions. However, the shape of the network in the diagram becomes more similar for all countries in 2023, indicating that the same spheres of digital business in all countries are being transformed at the same time (left side of Figure 2). Also, it shows how much the countries of the Western Balkans lag behind the countries of the European Union and in which categories. It is useful to analyse progress in order to identify areas that can be improved. All WB countries have advanced in all areas of digital transformation in 2023 compared to 2020. The biggest progress was made in the category of Data analytics - former Big Data and e-Invoices. However, it is still far from the EU average. When looking at the right part of the Figure, it is clearly seen that the EU countries dominate in all areas of digitization compared to the countries of the Western Balkans. It is clear that over the years, there has been an increase in all indicators, but the Western Balkan countries are closer to the EU average in 2023 than in 2020, with progress in both groups of countries. The highest gap between these is in Electronic information sharing. What is encouraging is that the Balkan countries are actually following the digital development of the EU, as we can see by the similar shape on the radar diagram. It is obvious that there is only one problem with the delay in the development of the countries of the Western Balkans.

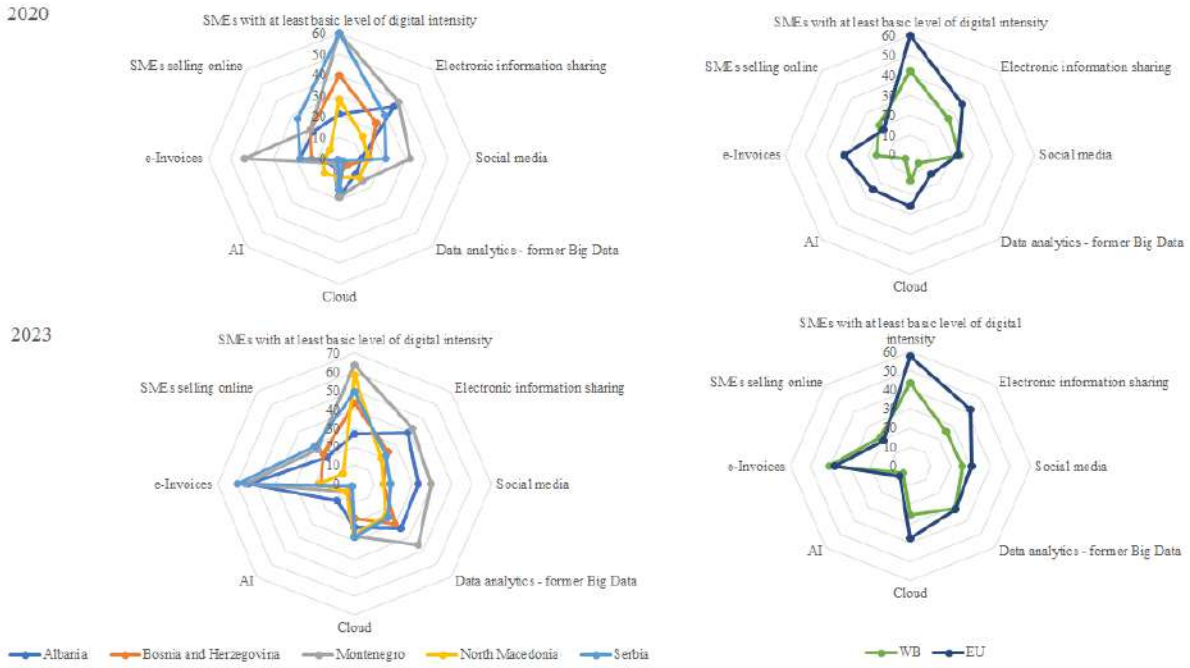


Figure 2. Differences in the digital transformation of businesses in WB and the EU (Authors)

The latest available data is shown in the Figure 3, where the difference in digital transformation between the average of the Western Balkan countries and the EU average can be more precisely observed. The best indicator for both groups of countries is SMEs with at least a basic level of digital intensity. However, there is also a big difference between these groups of countries. The biggest difference, as already mentioned, is with the Electronic information sharing indicator and amounts to 16.6 points. There is also a noticeable difference in Cloud. Similar level of development has been achieved in Data analytics - former Big Data. Western Balkan countries achieve better results than EU countries in e-Invoices and SMEs

selling online. Better performance in these indicators can be explained by several factors. First is strong regulatory enforcement, particularly in the case of the mandatory e-invoicing system in WB countries, which was not the case in the EU. It has accelerated the e-Invoice adoption rate. This caused a sudden mass application, hence the explanation for the jump in this indicator. The second factor can be the dominance of small and medium-sized enterprises in WB countries. SMEs enable faster and far more flexible implementation of digital instruments and tools than big companies. Additionally, the low initial level of digitization gave space for rapid implementation and growth, reflecting convergence dynamics rather than a long-term structural advantage.

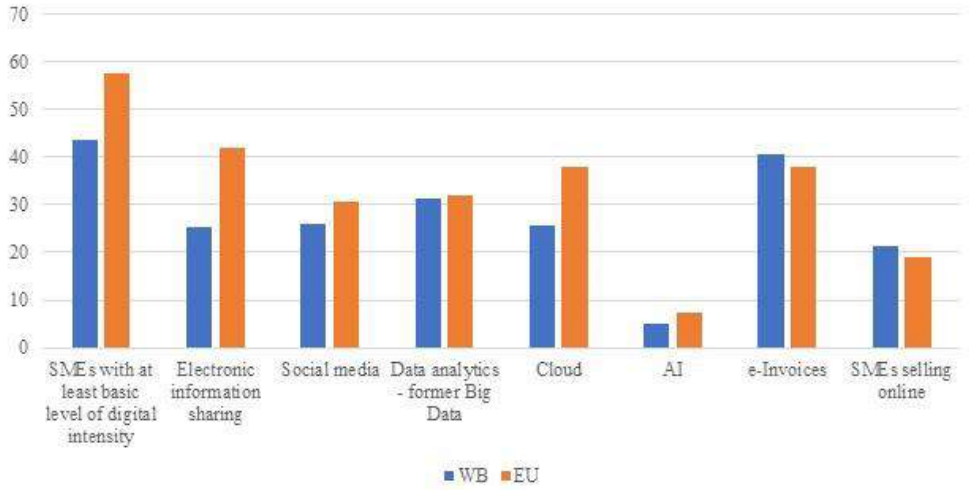


Figure 3. Digital transformation indicators of businesses in WB and EU in 2023

The countries of the Western Balkans have improved a lot in the application of digital technologies. Although there is still a significant gap behind EU countries, it can be said that progress is noticeable. In addition to regulatory regulations, an important factor that encouraged digitization was the pandemic caused by the covid-19 virus in 2020. In the conditions at the time, it was important for businesses to reorient themselves to digital business as soon as possible. However, from the data presented, we see that not all countries of the Western Balkans managed to maintain that level of digitization.

5. CONCLUSION

The paper analysed the digital transformation of business in the Western Balkan countries with special reference to the differences with EU member states, as well as the dynamics of changes from 2020 to 2023. The research results suggest that the WB countries still lag behind the EU average despite visible progress in the basic indicators of digitization. This is obvious in the application of advanced digital technologies such as artificial intelligence, cloud domputing and data analytics. In the same period, significant shifts were recorded in other indicators like SMEs with at least basic level of digital intensity. It indicates that there is a process of gradual convergence with more developed countries. Besides lagging behind EU countries, the results indicate that the digital transformation is not uniform throughout the region. There are visible differences between individual economies in the Western Balkans. Based on all the above, the first hypothesis is accepted.

Based on the presented analysis, it can be concluded that the WB countries are going through a transition phase of digital business transformation. Progress was made in the basic

forms of digitization, but there are still significant challenges regarding the wide application of advanced technologies, so the second research hypothesis is accepted. The further development of the digital environment requires continuous investments in digital infrastructure, innovation, and improvement of the regulatory framework in order to ensure a long-term elimination of the development gap in relation to the EU member states.

The work provides significant insights into the process of digital transformation of business in the Western Balkans. However, the limitations of the research primarily refer to a short period of time. However, DESI data is only available from 2020. Also, absolute comparability with DESI for EU countries is enabled only in 2022. The limitation is reflected in the method of data collection for each country, so not all DESI indicators are available. Future research directions can be directed towards examining the factors that have the strongest influence on the process of digitization and business innovation. Regardless of limitations, the research findings provide significant insights and also useful guidance to decision makers on the level of digital innovation need to be further developed. They should find a way to achieve this, bearing in mind the other aspects of economic growth. In addition, these results indicate the need for a systematic approach to the improvement of digital implementation through reform of the business system, encouraging young IT experts to stay in the country, continuous training for the workforce and better cooperation between countries. Focus should be placed on improving advanced digital skills, which are the basis for applying modern technologies and increasing competitiveness. It encourages business efficiency and creates conditions for long-term sustainable economic growth in the future.

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