Proceedings of the Faculty of Economics in East Sarajevo
Year 2024, Issue 29, pp. 39-47
Received: 24th April 2024

UDC 316.344.2:004.7
DOI: 10.7251/ZREFIS2429039C
Original Scientific Paper

Aleksandra Ćirić

Communications Regulatory Agency of BiH, Sarajevo
Bosnia and Herzegovina

✉ aleksandra.ciric.78@gmail.com

IMPACT OF DIGITAL TRANSFORMATION ON ECONOMIC GROWTH

УТИЦАЈ ДИГИТАЛНЕ ТРАНСФОРМАЦИЈЕ НА ЕКОНОМСКИ РАСТ

Summary: *We are living in a time of exciting, dynamic and fundamental technological changes. The expansion and development of new digital technologies leads to changes in all aspects of business, from strategic to operational. Digital transformation is the integration of digital technologies into the economy, public administration and society as a whole. Digital transformation is one of the main priorities of the European Union, which is already visible from the Lisbon Strategy and the adoption of the Digital Agendas. In this paper, our goal is to determine whether the progress of the European Union countries in the area of digital transformation, shown through the DESI index (digital economy and society index), has a positive impact on the economic growth of member states, measured by gross domestic product per capital.*
Keywords: *digital transformation, digital technologies, DESI index, GDP, European Union*
JEL classification: ***O32, O33***

Резиме: *Живимо у времену узбудљивих, динамичних и темељних технолошких промјена. Ширење и развој нових дигиталних технологија доводи до промјена у свим аспектима пословања, од стратегијских до оперативних. Дигитална трансформација представља интеграцију дигиталних технологија у економију, јавну управу и друштво, у цјелини. Дигитална трансформација је један од главних приоритета Европске уније, што је видљиво још из Лисабонске стратегије, те доношењем Дигиталних агенди. У овом раду нам је циљ да утврдимо да ли напредак земаља Европске уније у подручју дигиталне трансформације, приказан кроз DESI индекс (индекс дигиталне економије и друштва) има позитиван утицај на економски раст држава чланица, мјерен бруто домаћим производом по глави становника.*
Кључне речи: *дигитална трансформација, дигиталне технологије, DESI индекс, БДП, Европска унија*
ЈЕЛ класификација: ***O32, O33***

INTRODUCTION

Rapid technological development led to the global digital transformation of society, which became especially pronounced after the COVID-19 pandemic. Encouraging the development of digital technologies has significant advantages, but it also entails adapting to the challenges of the digital transition, ensuring a fair, open and secure digital environment and privacy protection. To secure digital sovereignty and strengthen capacities in digital technologies, the European Union adopted several strategies and agendas to maintain competitiveness with the US and Japanese economies.

Since 2014, the European Commission has been publishing data on the Digital Economy and Society Index (DESI), which monitors the member states' progress in digitization. This Index has been calculated since 2021For the Western Balkans countries, including Bosnia and Herzegovina. However, data for all subdimensions for 2021 were not available for our country.

The subject of the paper is the impact of digital transformation on economic growth. The goal is to determine if there exists a link between the Digital Economy and Society Index and economic growth, i.e. whether an increase in the value of individual components of the Index affects an increase in the gross domestic product.

Primary and secondary data sources were used for the purposes of the paper. The paper analyzed the data of individual components of the Index and gross domestic product per capita of 27 member states of the European Union (excluding Great Britain) from 2016 to 2021. A balanced panel model was defined based on the data, and the Eviews program was used for analysis.

The paper is divided into four chapters. The subject and goal, reference and methods of data collection, and the structure of the paper are presented in the introduction.

The second chapter refers to digital transformation, its stages, the development of digital transformation in Europe, the Western Balkans and Bosnia and Herzegovina, and the Digital Economy and Society Index.

The third chapter deals with the results of previous studies, the analysis of the DESI index of the European Union countries, and the presentation and analysis of the obtained results.

The fourth chapter refers to study conclusions and recommendations for future research related to this or a similar topic.

1. DIGITAL TRANSFORMATION

Digital transformation refers to the intensive application of digital technology and resources to turn these resources into new revenues, business models and ways of doing business. Transformation occurs when a company decides in a relatively short time to fundamentally change its business processes, strategies, activities, and hierarchical and organizational structure, aiming to properly connect those processes and strategies and ultimately provide a better competitive advantage to the company on the market (Spremić 2017).

Digital transformation in business involves using new technologies such as artificial intelligence and cloud computing to drive growth, simplify operations and increase competitive advantage. Its influence can be seen in every industry, driven by the development of online business and the ongoing digitization of business and society (Marr 2023).

1.1. Digital Transformation Phases

Digital changes have three phases: digitization, digitalization and digital transformation. Digitization is the encoding of analogue information into a digital format so that computers can store, process and transmit it (Verhoef et al, 2021). Digitization creates digital versions of analogue/physical things such as paper documents, photos, sounds, etc., but does not add value to the business.

Digitalization is the use of digital technologies to change existing business processes. Companies apply digital technologies through digitalization to optimize existing business processes by enabling more efficient coordination between processes and/or creating additional user value by improving the user experience (Verhoef et al. 2021).

Digital transformation is a deep and accelerated transformation of business activities, processes, competencies and models to fully utilize the possibilities of digital technologies and their impact on society in a strategic and prioritized manner (i-scoop 2023)

New trends in digital transformation are implantable technologies, wearable internet, internet of things (IoT), smart cities, big data, robotics, driverless cars, blockchain, sharing economy, and 3D printing (Pihir et al. 2018).

Implementing new digital technologies leads to new development trends called Industry 4.0 or the fourth industrial revolution. Industry 4.0 is primarily defined as the intelligent networking of machines and processes for industry with the help of information and communication technology (i-scoop 2023)

The World Trade Organization highlights the following trends and technologies of Industry 4.0: the Internet of Things (IoT), big data analytics, 3D printing, advanced (autonomous) robotics, smart sensors, augmented reality, cloud computing, energy storage, artificial intelligence, nanotechnology, synthetic biology, simulation, human-machine interface, mobile devices, cyber security, quantum computing, and horizontal and vertical integration (Ferrantino et al. 2019).

1.2. The development of digital transformation in Europe

At the meeting of the European Council in Lisbon in 2000, the Lisbon Strategy was adopted, with a common strategic goal for the European Union to become the most competitive and dynamic economy in the world based on knowledge, capable of sustainable economic growth, with more and better jobs, stronger social cohesion, and a sustainable environment by 2010 (European Parlament 2019). The strategy was a response to the progress of the US and Japanese economies, especially in terms of "knowledge" and dominance in information and communication technologies.

Following the Lisbon Strategy, the ten-year Digital Agenda was published in 2010. It emphasized information and communication technologies' crucial role in achieving European goals. The digital agenda was further developed in 2015 as part of the Single Digital Market Strategy, which aimed to ensure a fair, open and secure digital environment.

The second Digital Agenda for Europe 2020-2030 focused on the profound changes introduced by digital technologies, the essential role of digital services and markets and the EU's new technological and geopolitical ambitions (Ratcliff et al. 2023). Measures for secure digital services and markets are defined, and a digital compass is proposed with four goals relating to skills, enterprises, infrastructure and public services.

The European Union adopted a number of legislative acts, regulations and directives to implement the measures and goals defined in the Strategies and Agendas.

1.3. Digital transformation and the Western Balkans countries

Considering the global importance of digital transformation and the realization of set goals, and the need to strengthen cooperation within the entire European area, the Digital Agenda for the Western Balkans was launched at the digital assembly of the European Commission in Sofia in 2018. Its goal is to support the transition to a digital economy and realise the benefits of digital transformation, such as faster economic growth, more employees and better services. The Commission launched the Agenda with six Western Balkan partners – Albania, Bosnia and Herzegovina, Kosovo[1], Montenegro, the Former Yugoslav Republic of Macedonia and Serbia (EU u Srbiji 2024).

Developing countries, including the countries of the Western Balkans, face three major challenges in promoting and implementing digital technologies:

1. poverty – having no financial means to afford new products and services;
2. lack of skills – basic and standard skills in developing countries are by 10% up

20% lower compared to developed countries, while advanced technologies require digital skills, the ability to understand digital media, find information, and the like;

3. digital differences – advanced technologies require stable and fast fixed internet connections,which represents a significant deficiency in developing countries, bearing in mind that almost half of the world's population still does not have access to the network (UNCTAD 2021)

In November 2023, the European Commission adopted the Growth Plan for the Western Balkans, whose goals, among others, are to strengthen economic integration through a common regional market and with the joint European market, as well as an increase in 6 billion euros financial aid to support reforms. The growth plan should enable faster convergence of the Western Balkans with the European market, i.e. increase the average GDP per inhabitant. One of the strengthening activities with European integration is a single digital market, which undoubtedly points to further activities of the countries of the Western Balkans regarding the need for fast and efficient digital transformation.

1.4. Digital transformation and Bosnia and Herzegovina

The Council of Ministers of Bosnia and Herzegovina adopted the Information Society Development Policy of Bosnia and Herzegovina for the period 2017-2021, whose main goal is to plan activities to maximize the social and economic potential of ICT, especially the Internet as a significant means of economic and social activity.

Adoption of this Policy and the Policy of Information Security Management in the Institutions of Bosnia and Herzegovina, for the period 2017 - 2022, Bosnia and Herzegovina has defined its strategic commitment regarding the development of the information society and the improvement of information security in its territory.

Considering the complexity of the state regulation and jurisdiction, the implementation of the adopted documents is sluggish and significantly slows down the digitization process and the electronic business of companies. In addition, it is necessary to adopt several other strategic documents, such as the strategy for the development of the information society, the strategy for the development of broadband Internet access, and the like, which is very important for the further progress of the state in the field of digital transformation..

[1] According to United Nations Security Council Resolution 1244

1.5. DESI index

Since 2014, the European Commission has been monitoring the digital progress of member states through the Digital Economy and Society Index (DESI) report, which summarizes indicators of Europe's success in the field of digitization and monitors the progress of EU member states. DESI was developed following OECD guidelines and recommendations.

DESI enables four main types of analysis:

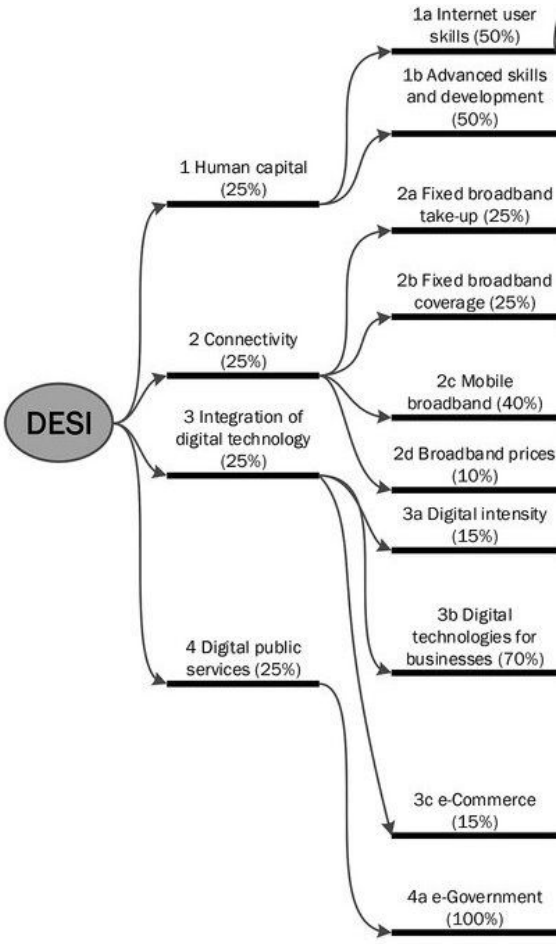
- General performance assessment: to obtain a general characterization of the performance of individual member states by observing their overall index score and the scores of the main dimensions of the index.
- Zooming: to specify the areas in which the performance of Member States can be improved by analyzing the results of sub-dimensions of the index and individual indicators.
- Monitoring: to assess whether there is improvement over time.
- Comparative analysis: grouping member states according to their index results, comparing countries at similar stages of digital development in order to highlight the need for improvement in relevant policy areas.

The DESI index has a three-layer structure and, according to the original methodology, it consisted of five main dimensions, each divided into a set of sub-dimensions composed of individual indicators. The main dimensions were: connectivity, digital skills, internet use, integration of digital technologies and public digital services.

In 2021, the Commission adapted DESI to reflect the two main policy initiatives that will have an impact on the digital transformation in the EU in the coming years: recovery and resilience, facility and digital decadal compass. The indicators are structured around four main areas in the Digital Compass, replacing the previous five-dimensional structure. (Picture 1)

DESI scores and rankings from previous years have been recalculated for all countries to reflect changes in indicator selection and corrections to baseline data have been made (European Comission 2024).

Scheme 1 DESI index - structure



Source: Machunga 2023

2. METHODOLOGY

This paper examines whether there is a relationship between the DESI index and economic growth. Therefore, the hypothesis is: An increase in the value of the components of the Digital Economy and Society Index leads to economic growth, i.e. an increase in the gross domestic product per capita in the European Union. Based on the obtained data, we could define recommendations for the direction of the legislation and the economy of Bosnia and Herzegovina regarding digital transformation.

2.1. Previous studies results

Olczyk and Kuc-Czarnecka analyzed the influence of the DESI index on GDP per capita from 2015 to 2020, concluding that economic growth, measured by GDP per capita, can be well explained by both the original and optimized DESI. They believe their results are important to policymakers for measuring, supporting and heightening digital transformation. These results reveal that for immediate and rapid analyses of the development of digital transformation or some international comparisons in this area, it is appropriate to consider only a few indicators, such as broadband Internet coverage (fixed, high-speed, 4G), the level of software skills and the percentage of companies analyzing big data and sell products and services online. These indicators are the most significant from the point of view of the level of digital transformation (Olczyk et al, 2022).

Ovidiu Mura and Donath determined the positive impact of digitization on economic growth in the EU-28, i.e. on GDP per capita, while including the DESI index as an independent variable only confirmed this positive impact (Mura 2023). Turuk examined the impact of DESI index components on GDP per capita in Central and Eastern European countries and found that the Connectivity and Human Capital components have no significant impact, while the Internet Use, Digital Technology Integration, and Digital Public Services components have a significant impact (Turuk 2020).

Examining the impact of digital evolution on economic growth using the International Digital Economy and Society Index (I-DESI), Török concluded that digital development has a positive effect on economic growth. However, digitalization cannot be successful without a correspondingly qualified user base. That is, digital education and training must be a priority to achieve an adequate digital transformation, above all in the wishes of the EU members lagging in the digital transition (Török 2024).

Similarly to the previous study, Aleksandrova, Truntsevsky and Polutova concluded that the positive impact of digital transformation on economic growth is possible only if the economic environment is prepared to accept such a transformation. An important part is the willingness of companies and the population to accept such changes. Three aspects should be taken into account to develop effective digitalization: the rate of economic growth, the state of digital life and the resilience of the environment (Aleksandrova et al. 2022) Examining the impact of broadband access on GDP per capita in a sample of 57 countries for the period from 2001 to 2016, Kabaklari and Atasoy noticed a positive impact, too. Nevertheless, their study also included the control variables in the analysis, i.e. human capital, openness of the economy to trade and gross investments in fixed capital. They also determined that these components have a positive effect on economic growth (Kabaklari et al. 2019). Zhang found that broadband Internet access was important in mitigating China's economic losses during the first months of 2020 and had a more significant impact on economic growth during the COVID-19 pandemic than in "normal" times (Zhang 2021).

In the study, Clerq et al. evaluated the regional, i.e. urban-rural, effects of high-speed broadband coverage in 1348 regions of the EU in the period 2011-2018. They concluded that the expansion of lower-speed access (30Mbit/s) accelerates economic growth in rural and urban areas, and the expansion of higher-speed access (30Mbit/s to 100Mbit/s) impacts rural areas. However, they noticed a lack of private capital investment for the necessary network expansion. Hence, the recommendation would be a public-private partnership and state aid (Clerq et al. 2023).

The need for state intervention was highlighted by Campbell et al., stating that since 1996, the Federal Government has been participating in the financing of network construction in sparsely populated areas, given that the return on investment is not sufficient to cover the expenses. Participation is present in the funds' formation through grants, imposition through auctions and the like (Campbell et al, 2021).

Therefore, there are many prior studies that have determined the positive impact of the development of digital technologies on economic growth, and their importance, readiness and necessary knowledge in their use, as well as the development of broadband infrastructure, were particularly highlighted during the pandemic. However, there is a gap in the development level, application and investment in digitization in developed and developing countries.

2.2. Variables explanation and data analysis

The paper used data on the values of individual components of the DESI index, namely DESI 2017-DESI 2022 and gross domestic product per capita for 2016-2021, considering that the calculated DESI index represents indicators for the previous year. Data on the recalculation of the DESI index according to the new methodology are available on http://www.eurostat.com/ for all of the European Union. Based on that, a balanced panel model was defined, with data for 27 member countries (except Great Britain) for a six-year period.

The Eviews program was used for the analysis, with the following meaning of variable abbreviations: dependent variable - GDP - grosses domestic product per capita, and independent variables: HC - Human capital, CON01 - Connectivity, IDT - Integration of digital technologies, DPS - Digital public services.

The Jarque-Bera test, i.e. the data normality distribution test, was done before the data analysis, indicating no normal data distribution, so logarithmic transformation was performed.

After that, a VIF (Variance Inflation Factor) test was performed to determine whether there is a problem of multicollinearity in the data, i.e. whether any of the independent variables are strongly related to other independent variables, which could affect the estimation of the parameter values, their significance, and direction of influence on the dependent variable.

Table 1 VIF (Variance Inflation Factor) test

Variance Inflation Factors
Date: 02/09/24 Time: 22:59
Sample: 2016 2021
Included observations: 162

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
LCON01	0.010580	57.23124	1.395226
LDPS	0.015692	120.3268	2.610551
LHC	0.072051	468.1284	3.419948
LIDT	0.021555	92.42534	3.400701
C	0.196508	217.6022	NA

Source: author's calculation

The value of the Centered VIF for all independent variables is less than 10, so there is no problem of multicollinearity, i.e. no independent variable is in a strong linear relationship with other independent variables, and i.e. it is a weak correlation.

After that, all three models follow - the constant coefficients, the fixed effects and the random effects model.

Table 2 The constant coefficients model

Dependent Variable: LBDP
Method: Panel Least Squares
Date: 02/09/24 Time: 23:00
Sample: 2016 2021
Periods included: 6
Cross-sections included: 27
Total panel (balanced) observations: 162

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LCON01	-0.021083	0.102858	-0.204976	0.8379
LDPS	-0.134722	0.125268	-1.075469	0.2838
LHC	1.641566	0.268423	6.115595	0.0000
LIDT	0.519538	0.146815	3.538737	0.0005
C	5.579100	0.443292	12.58560	0.0000

Source: author's calculation

Table 3 The fixed effects model

Dependent Variable: LBDP
Method: Panel Least Squares
Date: 02/09/24 Time: 23:01
Sample: 2016 2021
Periods included: 6
Cross-sections included: 27
Total panel (balanced) observations: 162

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LCON01	-0.062635	0.032046	-1.954540	0.0528
LDPS	0.354806	0.071949	4.931324	0.0000
LHC	0.328176	0.191653	1.712347	0.0892
LIDT	0.117187	0.067673	1.731658	0.0857
C	8.342469	0.376860	22.13677	0.0000

Effects Specification
Cross-section fixed (dummy variables)

Source: author's calculation

Table 4 The random effects model

Dependent Variable: LBDP
Method: Panel EGLS (Cross-section random effects)
Date: 02/09/24 Time: 23:03
Sample: 2016 2021
Periods included: 6
Cross-sections included: 27
Total panel (balanced) observations: 162
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LCON01	-0.077896	0.031323	-2.486836	0.0139
LDPS	0.330550	0.070208	4.708130	0.0000
LHC	0.531741	0.180161	2.951476	0.0036
LIDT	0.122568	0.066414	1.845513	0.0668
C	7.937243	0.359434	22.08259	0.0000

Source: author's calculation

Given that the constant coefficients model assumes there are no differences between the data matrix in the cross-sectional dimension, the Lagrange Multiplier Test was performed for the random effects model.

Table 5 LM (Lagrange Multiplier)

Lagrange Multiplier Tests for Random Effects
Null hypotheses: No effects
Alternative hypotheses: Two-sided (Breusch-Pagan) and one-sided (all others) alternatives

	Test Hypothesis		
	Cross-section	Time	Both
Breusch-Pagan	357.3975	0.141865	357.5393
	(0.0000)	(0.7064)	(0.0000)

Source: author's calculation

The Breush-Pagan test shows a p-value less than 0.05, indicating there are random effects, i.e. the model of constant coefficients is inadequate. Thus, the Hausman test was performed to determine which model is more satisfactory, the random or fixed effects one.

Table 6 Hausman test

Correlated Random Effects - Hausman Test
Equation: EQ01
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	15.456791	4	0.0038

Source: author's calculation

Given that the p-value is less than 0.05, we reject the null hypothesis, i.e. the fixed effects model is more adequate, so its data are used for the interpretation of the results.

In the fixed effects model, the statistically significant variable, at the 1% level, is Digital Public Services, with a positive effect. At the 5% level, the statistically significant variable is Connection, with a negative effect. At the 10% level, statistically significant variables are Human capital and Integration of digital technologies with a positive effect.

Therefore, if the value of the Digital Public Service component increases by 1%, the gross domestic product per capita will increase by 0.35%. If the value of the Connectivity component increases by 1%, the gross domestic product per capita will decrease by 0.06%. If the value of the Human Capital and Integration of Digital Technologies components increases by 1%, the gross domestic product per capita will increase by 0.32% and 0.11%, respectively.

The conducted analysis confirmed the hypothesis that an increase in the value of the Digital Economy and Society Index leads to economic growth. The three components of the Index, Digital Public Services, Human Capital and Integration of Digital Technologies show a positive impact, where the impact of Digital Public Services stands out as statistically significant.

The negative impact of Connectivity contradicts the findings of previous studies, so this result should be additionally investigated. Further research should be aimed at examining whether an increase in the individual values of the subdimensions of the DESI index components, such as skills of internet users, fixed broadband internet access - coverage, business digitization or e-governance affect economic growth. At the same time, considering the unequal development of the countries of the European Union, the tests could be directed separately to developed countries, developing countries, and especially to countries that are in the accession process, to determine their shortcomings and weaknesses.

CONCLUSION

Digital transformation and digitization have become inevitable processes in all social aspects. Digital technologies occupy a central place in defining business strategies, but they also bring innovations, opportunities for growth and development, and easier communication with business partners and the world.

The paper examined the impact of digital transformation on economic growth, and analyzed the impact of individual components of the Digital Economy and Society Index (DESI), as an indicator of Europe's success in the field of digitalization, on the increase in gross domestic product per capita, as an indicator of economic growth. The DESI index has been calculated for the countries of the European Union since 2014, and it was calculated for the countries of the Western Balkans for 2021 and 2022. The report also included Bosnia and Herzegovina, with the fact that data was not available for all sub-dimensions for 2021.

Based on the results of the panel analysis, it was specified that the components of Digital Public Services, Human Capital and Integration of Digital Technologies have a positive effect on economic growth, while Connectivity has a slightly negative effect. Further research should focus on analyzing the impact of the sub-dimensions of each component of the index, as we would get more detailed and precise data for individual areas, such as the level of digital skills, use of Internet access, coverage, e-business, digitalization of enterprises and the like.

Certainly, the further legislation of Bosnia and Herzegovina should be aimed at adopting adequate strategies and action plans with a clear definition of development directions in the field of digitization and digital transformation. In addition, the active participation of the economy and individuals is necessary to ensure the required competitiveness and follow existing trends.

REFERENCE:

Aleksandrova, Ariadna, Yuri Truntsevsky, and Marina Polutova. 2022. "Digitalization and Its Impact on Economic Growth." Accessed October 5, 2024. https://www.researchgate.net/publication/360397311.

Campbell, Steven, Robert J. Castro, and David Wessel. 2021. "The Benefits and Costs of Broadband Expansion." Accessed October 7, 2024. https://www.brookings.edu/articles/the-benefits-and-costs-of-broadband-expansion/.

Clercq, Marc, Marijke D'Haese, and Jeroen Buysse. 2023. "Economic Growth and Broadband Access: The European Urban-Rural Digital Divide." Accessed October 7, 2024. https://www.sciencedirect.com/science/article/pii/S0308596123000903.

EU U Srbiji. 2023. Evropska komisija pokreće Digitalnu agendu za Zapadni Balkan. Accessed on December 2. https://europa.rs/evropska-komisija-pokrece-digitalnu-agendu-za-zapadni-balkan/

European Comission 2024. Digital Strategy. Accessed March 5. https://digital-strategy.ec.europa.eu. https://digital-strategy.ec.europa.eu

European Parlament 2009.Briefing Note for the Meeting of the EMPL Committee 5 October 2009 Regarding the Exchange of Views on the Lisbon Strategy and the EU Cooperation in the Field of Social Inclusion. 2009. https://www.europarl.europa.eu/meetdocs/2009_2014/documents/empl/dv/lisbonstrategybn_/lisbonstrategybn_en.pdf.

Ferrantino, Michael J., and Emine Elcin Koten. 2019. "Understanding Supply Chain 4.0 and Its Potential Impact on Global Value Chains." In *Global Value Chain Development Report 2019*, 103–19. Accessed [date not specified]. https://www.wto.org/english/res_e/booksp_e/gvc_dev_report_2019_e_ch5.pdf.

i-Scoop. 2023a. "Digitization, Digitalization, Digital Transformation, and Disruption." Accessed November 25, 2023. https://www.i-scoop.eu/digital-transformation/digitization-digitalization-digital-transformation-disruption/.

i-Scoop. 2023b. "Industry 4.0 Definitions." Accessed November 25. https://www.i-scoop.eu/industry-4-0/#7-industry-40-definitions-what-is-industry-40/.

Kabaklarli, Esra, and Burak Sencer Atasoy. 2019. "Broadband Infrastructure and Economic Growth: A Panel Data Approach for Selected Countries." Accessed October 5, 2024. https://hrcak.srce.hr/file/332637.

Machuga, Roman. 2023. "GDP Impact on the Digital Economy in European Union Countries." *Olsztyn Economic Journal* 2: 127–140.

Marr, Bernard. 2023. "The Impact of Digital Transformation on Business Models: Opportunities and Challenges." Accessed December 8, 2023. https://www.marr.com/sites/bernardmarr/2023/10/12/the-impact-of-digital-transformation-on-business-models-opportunities-and-challenges/?sh=21ced3e44f82.

Mura, Petronela Ovidia, and Loredana Eva Donath. 2023. "Digitalisation and Economic Growth in the European Union." Accessed December 8, 2023. https://www.mdpi.com/2079-9292/12/7/1718.

Olczyk, Magdalena, and Marta Kuc-Czarnecka. 2022. "Digital Transformation and Economic Growth – DESI Improvement and Implementation." Accessed December 8, 2023. https://journals.vilniustech.lt/index.php/TEDE/article/view/16766.

Pihir, Ivan, Katarina Tomičić-Pupek, and Martina Tomičić Furjan. 2018. "Digital Transformation Insights and Trends." In *Proceedings of the Central European Conference on Information and Intelligent Systems*, 141–50.

Ratcliff, Charles, Michael Wosyka, Barbara Martinello, and Daniel Franco. 2023. "Digital Agenda for Europe." Accessed December 2, 2023. https://www.europarl.europa.eu/factsheets/en/sheet/64/digitalna-agenda-za-europu.

Službeni list BiH. *2017*. "Politika razvoja informacionog društva Bosne i Hercegovine za period 2017-2021. godina." Broj 42/17.

Spremić, Mario. 2017. *Digitalna transformacija poslovanja*. Zagreb: Ekonomski fakultet, 53.

Török, Lajos. 2024. "The Relationship Between Digital Development and Economic Growth in the European Union." Accessed October 5, 2024. https://doi.org/10.1556/1848.2024.00797.

Turuk, Mladen. 2021. "An Overview of Digital Entrepreneurship in Central and Eastern European Countries." Accessed December 9, 2023. https://www.intechopen.com/chapters/74976.

United Nations Conference on Trade and Development (UNCTAD). 2021. *Catching Technological Waves: Innovation with Equity*. Accessed October 4, 2024. https://unctad.org/system/files/official-document/tir2020_en.pdf.

Verhoef, Peter C., Tammo H. A. Broekhuizen, Yakov Bart, Abhijit Bhattacharya, Jan K. Qi Dong, Nicola Fabian, and Michael Haenlein. 2021. "Digital Transformation: A Multidisciplinary Reflection and Research Agenda." *Journal of Business Research*, Vol. 122. Accessed November 25, 2023.

Zhang, Xiaohong. 2021. "Broadband and Economic Growth in China: An Empirical Study During the COVID-19 Pandemic Period." Accessed October 5, 2024. https://www.sciencedirect.com/science/article/pii/S0736585320301921.