St. Cyril and St. Methodius University of Veliko Tarnovo
Faculty of Economics

ДИГИТАЛНАТА ТРАНСФОРМАЦИЯ КАТО ФАКТОР ЗА КОНКУРЕНТОСПОСОБНОСТТА НА БЪЛГАРСКАТА ИКОНОМИКА

DIGITAL TRANSFORMATION AS A FACTOR FOR THE COMPETITIVENESS OF THE BULGARIAN ECONOMY

Любомира Спасова
Lyubomira Spasova

Тракийски университет
Trakia University

Abstract: The present study examines digital transformation as a structural factor influencing the competitiveness of the Bulgarian economy within the context of the European digital transition. The analysis is based on contemporary theoretical frameworks of economic growth and empirical evidence linking digitalization with productivity, innovation, and long-term economic performance. The paper explores the current state of digital development in Bulgaria, focusing on digital skills, technological integration in enterprises, and the level of digital public services. The findings reveal an asymmetric model of digital transformation characterized by relatively advanced e-government services but structural deficiencies in human capital and limited adoption of advanced digital technologies in the business sector. The study highlights the economic channels through which digitalization affects competitiveness, including total factor productivity, investment activity, export performance, and resilience to economic crises. The results support the thesis that accelerating digital integration, combined with institutional reforms and human capital development, could significantly enhance Bulgaria's long-term growth potential and competitive position within the European economic space.
Keywords: digital transformation; competitiveness; productivity; economic growth; Bulgaria.
JEL: O33, O47, F15

INTRODUCTION

In the context of accelerating globalization and deepening technological transformation, digitalization has emerged as one of the key drivers of economic growth and enhanced competitiveness of national economies (Brynjolfsson & McAfee, 2014; OECD, 2019). The development of information and communication technologies, the automation of production processes, the expansion of artificial intelligence, and the rise of digital platforms are reshaping the structure of value creation, organizational models, and the mechanisms of international trade (World Bank, 2021). In this context, the ability of national economies to integrate digital technologies becomes a strategic advantage within the European Union and the global economic environment (European Commission, 2023).

For Bulgaria, digital transformation represents both a challenge and an opportunity. On the one hand, the country lags behind in several indicators related to digital skills, innovation adoption, and the level of digitalization of small and medium-sized enterprises (European Commission, 2023). On the other hand, the presence of a dynamic ICT (Information and Communication Technologies) sector and the increasing share of digital services in exports create conditions for accelerated modernization of the economic structure (OECD, 2021). In this regard, digitalization can be considered an instrument for

improving labor productivity, attracting foreign direct investment, and strengthening export competitiveness (Jorgenson & Vu, 2016).

The aim of this study is to analyse the role of digital transformation as a factor for the competitiveness of the Bulgarian economy. To achieve this objective, the following tasks are set: to clarify the theoretical relationship between digitalization and economic growth; to assess the current state of digital development in Bulgaria; and to identify the main economic effects and structural constraints of the process. The main thesis defended in the paper is that accelerated and targeted digital transformation has the potential to enhance the resilience and competitive position of the Bulgarian economy within the European economic space.

THEORETICAL FRAMEWORK

Digital transformation represents a complex process of integrating digital technologies into economic systems, leading to structural changes in both production processes and organizational practices within the business and public sectors (Bughin et al., 2019; Schwab, 2016). In economic theory, technological progress has long been recognized as a key driver of growth, beginning with the classical Solow growth model, according to which technological improvements increase total factor productivity (Solow, 1956). More recent endogenous growth models emphasize the role of human capital and innovation as internal sources of long-term economic expansion (Romer, 1990; Aghion et al., 2019).

Contemporary research places digitalization at the core of economic competitiveness, viewing it not only as a technological shift but also as an institutional transformation. Information and Communication Technologies (ICT) are associated with reduced transaction costs, increased speed of information flows, and expanded market opportunities for firms (OECD, 2020; Brynjolfsson et al., 2020). According to the World Economic Forum (2020), digital platforms and automation are redefining production chains, requiring adaptation by both businesses and public policy frameworks. The concept of national competitiveness encompasses both microeconomic and macroeconomic dimensions, ranging from firms' capacity to innovate to the state's ability to provide a supportive digital infrastructure (Porter, 1990; Ketels, 2016). The European Commission and international institutions identify digital transformation as a strategic priority for enhancing sustainable growth and regional convergence through initiatives such as Digital Europe and Horizon Europe (European Commission, 2023; European Investment Bank, 2021).

Empirical studies confirm a positive relationship between the degree of digitalization and economic performance: countries with higher levels of digital infrastructure, human capital, and innovation ecosystems demonstrate higher productivity, stronger economic growth, and greater resilience in times of economic instability (OECD, 2021; McKinsey Global Institute, 2022). A study by the International Monetary Fund (IMF, 2023) finds that digital investments have a cumulative positive impact on GDP per capita through productivity gains and enhanced participation in global value chains. Therefore, the theoretical framework of the present study is based on the understanding that digital transformation is an integrated driver of economic growth, influencing technological capacity, production efficiency, and the competitive position of national economies.

DIGITAL TECHNOLOGIES AS GENERAL PURPOSE TECHNOLOGIES AND THE PRODUCTIVITY PARADOX

A deeper theoretical interpretation of digital transformation can be found within the framework of General Purpose Technologies (GPT). General Purpose Technologies are innovations characterized by wide applicability, continuous improvement, and strong complementarities with other sectors of the economy (Helpman, 1998). Similar to electricity or the steam engine, digital technologies—particularly artificial intelligence, cloud computing, and data analytics—function as enabling infrastructures that reshape production systems and organizational models across industries. Their economic impact is not confined to individual sectors but extends horizontally throughout the economy, generating systemic productivity effects.

However, the diffusion of GPTs is often accompanied by a time lag between technological adoption and measurable productivity gains, a phenomenon widely referred to as the "productivity para-

dox" (Brynjolfsson, 1993). Initial investments in digital technologies may not immediately translate into higher output because firms require complementary investments in human capital, organizational restructuring, and intangible assets. Brynjolfsson, Rock, and Syverson (2020) argue that productivity gains materialize only when digital technologies are integrated with managerial innovation and institutional adaptation. This perspective suggests that the economic returns of digital transformation depend not solely on technological infrastructure, but also on the absorptive capacity of firms and the broader institutional environment.

In the context of Bulgaria, the GPT framework provides an explanation for the asymmetric pattern of digitalization: while digital public services are relatively advanced, insufficient complementary investments in skills and enterprise-level innovation constrain the realization of full productivity effects. Thus, digital transformation should be interpreted as a long-term structural process rather than an immediate technological upgrade.

STATE OF DIGITALIZATION IN BULGARIA

The state of digitalization in Bulgaria can be assessed through the analysis of key indicators related to human capital, the degree of technological integration in enterprises, and the development of effective e-government services, while the comparative framework within the European Union allows for an objective positional evaluation. According to the European Commission (2024), the share of the population in Bulgaria with at least basic digital skills remains significantly below the EU average (35.5% compared to 55.6%), which limits the economy's capacity to absorb and effectively utilize digital technologies. This gap not only reflects differences in educational attainment but also reveals structural weaknesses in lifelong learning systems and workforce reskilling policies, which are critical in the context of rapid technological change.

National statistics further complement this picture by revealing pronounced disparities by education level and age: in 2023, individuals with basic or above-basic digital skills accounted for 65.3% among those with higher education, compared to only 14.6% among those with primary or lower education; by age group, the highest shares were recorded among individuals aged 16–24 (53.2%) and 25–34 (49.2%), while among those aged 65–74 the figure was only 7.3% (NSI, 2023). These disparities indicate the presence of a digital divide both across generations and across educational groups, which may exacerbate income inequalities and reduce labor market adaptability in the long term. The low level of digital literacy constitutes a structural barrier to productivity growth and innovation adoption, as OECD (2023) emphasizes that the returns on digital investments are strongly dependent on the quality of human capital.

At the enterprise level, Bulgaria continues to demonstrate limited diffusion of advanced digital technologies. The use of cloud services, big data analytics, and artificial intelligence technologies among Bulgarian enterprises remains below the EU average, indicating slower technological modernization and weaker integration into global value chains (European Commission, 2024). According to the Digital Decade Country Report 2024, the share of enterprises in Bulgaria using at least one of the following technologies—cloud computing, data analytics, or AI—amounts to 29.3%, compared to an EU average of 54.6% (European Commission, 2024). The relatively low adoption rates suggest that many firms remain positioned in lower value-added segments of production networks, relying on cost competitiveness rather than technological intensity.

Furthermore, the digitalization gap is not only quantitative but also structural. While certain sectors—particularly ICT and business services—demonstrate higher levels of digital maturity, traditional industries and small enterprises often lack the financial and organizational capacity to undertake digital transformation. This asymmetry constrains the spillover effects that typically characterize digital economies and limits the aggregate productivity impact at the macroeconomic level. Consequently, Bulgaria's digital development trajectory reflects partial progress, yet insufficient systemic integration of digital technologies across the broader economic structure.

Table 1. Selected Indicators of Digitalization in Bulgaria (latest available data)

Indicator	Bulgaria	EU Average
Population with at least basic digital skills	35.5%	55.6%
Enterprises using at least one advanced technology (cloud/data/AI)	29.3%	54.6%
Use of cloud services	14.2%	38.9%
Use of AI	3.6%	8%
Use of data analytics	21.9%	33.2%
Digital public services for businesses	91.9/100	85.4

Source: European Commission (2024); NSI (2023)

Empirical studies show that the productivity gains from digital technologies are more substantial in economies that combine technological investments with organizational change and the development of intangible assets (Brynjolfsson, Rock & Syverson, 2020), suggesting that lagging in these areas reduces the potential for accelerated growth. At the same time, Bulgaria demonstrates relatively strong performance in the digitalization of public services for businesses, achieving a score of 91.9/100, which exceeds the EU average (85.4) and is identified as one of the country's main strengths in the European Commission's report (European Commission, 2024). This creates favourable conditions for reducing administrative burdens and improving the business environment. However, as emphasized by the IMF (2023), the sustainable macroeconomic impact of digital transformation requires synchronized development of both public and private investments in digital infrastructure and innovation.

In summary, the available evidence indicates an asymmetric pattern of digital transformation in Bulgaria, characterized by progress in institutional digitalization but structural deficiencies in human capital and technological absorption within the real sector. These limitations constrain the potential impact on productivity, economic growth, and international competitiveness (OECD, 2023; European Commission, 2024).

ECONOMIC EFFECTS OF DIGITAL TRANSFORMATION

The economic effects of digital transformation are manifested through several interrelated channels, including increases in total factor productivity, structural changes in value added, intensification of international trade, and strengthened investment activity. Within the neoclassical framework, technological progress is regarded as a primary source of sustainable economic growth (Solow, 1956), while endogenous growth models emphasize the role of innovation and human capital accumulation as internal drivers of long-term economic dynamics (Romer, 1990; Aghion et al., 2019). In contemporary conditions, digitalization represents a specific form of technological progress that affects total factor productivity through automation, optimization of production processes, and reduction of transaction costs (Jorgenson & Vu, 2016; OECD, 2023).

Empirical research confirms that investments in information and communication technologies have a significant impact on productivity and GDP per capita (Brynjolfsson, Rock & Syverson, 2020; IMF, 2023). According to OECD (2023), economies with higher levels of digital integration experience faster productivity growth, particularly when technological investments are combined with organizational innovation and the development of intangible assets. The World Bank (2021) also emphasizes that digital infrastructure and access to data enhance market efficiency, improve resource allocation, and stimulate entrepreneurship. The relationship between digitalization and key macroeconomic indicators can be summarized through the main economic channels presented in Table 2.

Table 2. Main Economic Effects of Digital Transformation

Channel of Impact	Economic Effect	Supporting Studies
Technological integration	Increase in labor productivity	Jorgenson & Vu (2016); OECD (2023)
Digital investments	Growth of GDP per capita	IMF (2023); Brynjolfsson et al. (2020)
Digital infrastructure	Improved resource allocation and market efficiency	World Bank (2021)
Integration into global value chains	Increased exports and competitiveness	European Commission (2023); Porter (1990)
Institutional digitalization	Reduction of transaction costs	OECD (2023)

Source: Author's systematization based on OECD (2023), IMF (2023), World Bank (2021), European Commission (2023), and Brynjolfsson et al. (2020)

Digital transformation also exerts a substantial influence on international competitiveness by expanding access to external markets and facilitating participation in global value chains. Porter (1990) defines competitiveness as the ability of a national economy to achieve sustained productivity growth under conditions of international competition, and in the digital era this process is closely linked to the intensity of technological adoption. According to the European Commission (2023), the digital transition is a strategic instrument for enhancing export potential and innovation capacity. IMF data (2023) indicate that countries with higher levels of digital maturity demonstrate greater resilience during economic crises and recover more rapidly from external shocks.

In the context of Bulgaria, the economic effects of digitalization are unevenly distributed. On the one hand, the development of the ICT sector and the increasing share of digital services in exports create conditions for higher value added and greater attraction of foreign direct investment (OECD, 2023). On the other hand, the limited adoption of advanced technologies across the broader corporate sector constrains the scale of potential productivity gains. Brynjolfsson and McAfee (2014) argue that digital technologies generate substantial economic benefits, but these are fully realized only in the presence of complementary institutional and organizational changes, highlighting the need for a comprehensive transformation strategy.

Thus, the economic effects of digital transformation extend beyond technological upgrading and represent a complex process of structural modernization that influences productivity, investment activity, economic scale, and resilience. International evidence confirms that the degree of digital integration is positively associated with long-term economic growth and competitiveness (OECD, 2023; IMF, 2023; World Bank, 2021), supporting the thesis that accelerating the digital transition in Bulgaria could serve as a key factor in strengthening its position within the European economic space.

CONCEPTUAL FRAMEWORK OF DIGITAL COMPETITIVENESS

The relationship between digital transformation and competitiveness can be summarized through a conceptual framework linking technological integration with macroeconomic performance. Digital transformation operates through cumulative and interdependent mechanisms, where technological adoption interacts with human capital, institutional quality, and innovation capacity. Rather than producing isolated effects, digital integration generates a sequential chain of economic impacts that ultimately determine a country's growth potential and competitive positioning within the global economy.

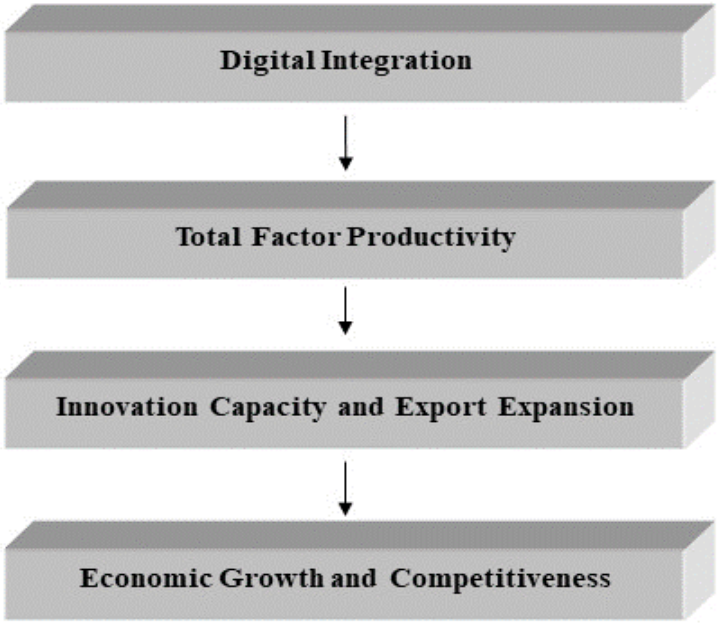


Figure 1. Conceptual Framework Linking Digital Integration and Competitiveness
Source: Author's conceptualization

At the microeconomic level, digital technologies enhance firm efficiency and reduce transaction costs. At the macroeconomic level, aggregated productivity gains translate into higher GDP per capita, increased investment attractiveness, and stronger participation in global value chains. This framework emphasizes that digital competitiveness is not an isolated outcome, but the cumulative result of technological, institutional, and human capital development.

CHALLENGES AND PROSPECTS FOR DIGITAL TRANSFORMATION IN BULGARIA

Despite the identified positive effects of digitalization, the process of digital transformation in Bulgaria is accompanied by a number of structural challenges that limit its scope and economic impact. First, the deficit of digital skills and the shortage of qualified labor remain among the main barriers to the technological modernization of enterprises (European Commission, 2024). OECD (2023) emphasizes that insufficient human capital reduces the returns on digital investments and slows the process of innovation diffusion within the economy. Second, the limited adoption of advanced digital solutions among small and medium-sized enterprises (SMEs) represents a significant structural constraint. SMEs constitute the backbone of the Bulgarian economy, yet they frequently face difficulties related to access to finance, technological expertise, and strategic management of digital processes (European Investment Bank, 2021). In addition, regional disparities in digital infrastructure and uneven access to high-speed broadband further exacerbate structural imbalances within the national economy. Rural and less economically developed regions tend to lag behind in both digital connectivity and technological adoption, which limits their participation in digital value chains and deepens productivity gaps. Furthermore, regulatory complexity and administrative burdens may discourage private investment in advanced digital solutions, thereby slowing the pace of comprehensive digital transformation. The main structural challenges can be classified according to their economic impact, as presented in Table 3.

Table 3. Main Challenges to Digital Transformation in Bulgaria

Challenge	Economic Impact	Sources
Low digital skills	Limited productivity and innovation capacity	European Commission (2024); OECD (2023)
Weak adoption of AI and cloud technologies	Lower technological intensity and competitiveness	European Commission (2024)
Limited SME access to financing	Delayed technological modernization	European Investment Bank (2021)
Insufficient integration of intangible assets	Low returns on digital investments	Brynjolfsson et al. (2020)

Source: Author's systematization based on OECD (2023), European Commission (2024), EIB (2021), and Brynjolfsson et al. (2020)

At the same time, significant prospects exist for accelerating the digital transition. European programs aimed at digitalization, innovation, and structural modernization create opportunities for mobilizing public and private investments (European Commission, 2023). International analyses demonstrate that economies that successfully combine digital technologies with organizational change and human capital development achieve higher and more sustainable growth (Brynjolfsson, Rock & Syverson, 2020; IMF, 2023). Strategic prioritization of investments in digital infrastructure, education, and innovation ecosystems could therefore strengthen Bulgaria's position within the European economy. In the long term, the country's competitiveness will depend on its ability to overcome existing imbalances between institutional digitalization and the actual technological integration within the productive sector. Coordinated policies in education, innovation, and industrial modernization may transform digitalization into a sustainable driver of economic growth and higher value added.

METHODOLOGICAL APPROACH

This study adopts a qualitative analytical approach based on secondary data from international institutions and official statistical sources. The empirical assessment relies on indicators related to digital skills, enterprise-level technological adoption (cloud computing, artificial intelligence, and data analytics), digital public services, and macroeconomic variables such as GDP per capita and export performance. The primary data sources include the European Commission's Digital Decade Reports, OECD Digital Economy Outlook, World Bank World Development Report, IMF World Economic Outlook, and National Statistical Institute data.

The analysis follows a comparative framework, positioning Bulgaria relative to the European Union average in order to identify structural gaps and competitive advantages. The methodological logic is based on examining the relationship between digital integration and key macroeconomic outcomes through established theoretical models of technological progress and competitiveness. While the study does not employ econometric modelling, it synthesizes empirical findings from international research to construct an analytical linkage between digital transformation and economic performance.

CONCLUSION

This study has examined digital transformation as a structural determinant of the competitiveness of the Bulgarian economy within the broader framework of the European digital transition. The theoretical review confirms that digitalization constitutes a contemporary form of technological progress that enhances productivity, stimulates innovation, and supports long-term economic growth (Solow, 1956; Romer, 1990; OECD, 2023). Empirical evidence further demonstrates a positive association between

digital integration and key macroeconomic indicators, including GDP per capita, export performance, and investment activity (IMF, 2023; World Bank, 2021).

The analysis of Bulgaria's digital development highlights an asymmetric pattern: while the country performs relatively well in the provision of digital public services, significant structural weaknesses persist in terms of digital skills and the adoption of advanced technologies in the business sector (European Commission, 2024). This structural imbalance limits the capacity of the economy to fully capture productivity gains and to translate digital investments into sustained value-added growth.

The findings suggest that digital transformation should not be viewed solely as technological upgrading, but as a comprehensive structural process requiring coordinated institutional, educational, and industrial policies. Strengthening human capital, accelerating enterprise-level technological modernization, and ensuring effective utilization of European funding mechanisms are critical preconditions for maximizing the economic returns of digitalization. In this context, the acceleration of Bulgaria's digital integration represents not merely a policy option, but a strategic imperative for enhancing long-term growth potential, economic resilience, and competitive positioning within the European economic space.

REFERENCES

Aghion, P., Akcigit, U. & Howitt, P. 2019. *The economics of growth*, MIT Press, Cambridge, MA.

Brynjolfsson, E. 1993. The productivity paradox of information technology, *Communications of the ACM*, vol. 36, no. 12, pp. 66–77.

Brynjolfsson, E. & McAfee, A. 2014. *The second machine age: Work, progress, and prosperity in a time of brilliant technologies*, W. W. Norton & Company, New York.

Brynjolfsson, E., Rock, D. & Syverson, C. 2020. The productivity J-curve: How intangibles complement general purpose technologies, *American Economic Journal: Macroeconomics*, vol. 12, no. 2, pp. 333–372.

Bughin, J., Seong, J., Manyika, J., Chui, M. & Joshi, R. 2019. *Notes from the AI frontier: Modeling the impact of AI on the world economy*, McKinsey Global Institute, New York.

European Commission 2023. *Digital Europe Programme*, viewed 15 January 2026, https://digital-strategy.ec.europa.eu/en/activities/digital-programme.

European Commission 2024. *Digital decade country report 2024: Bulgaria*, viewed 15 January 2026, https://digital-strategy.ec.europa.eu/en/library/digital-decade-country-report-2024-bulgaria.

European Investment Bank 2021. *Digitalisation in Europe 2020–2021*, European Investment Bank, Luxembourg, viewed 15 January 2026, https://www.eib.org/en/publications/digitalisation-in-europe-2020-2021.

Helpman, E. (ed.) 1998. *General purpose technologies and economic growth*, MIT Press, Cambridge, MA.

International Monetary Fund 2023. *World economic outlook 2023*, IMF, Washington, DC, viewed 15 January 2026, https://www.imf.org/en/Publications/WEO.

Jorgenson, D. W. & Vu, K. M. 2016. The ICT revolution and economic growth, *Telecommunications Policy*, vol. 40, no. 5, pp. 383–397.

Ketels, C. 2016. *Review of competitiveness frameworks*, National Competitiveness Council, Dublin.

McKinsey Global Institute 2022. *The economic potential of generative AI*, McKinsey & Company, New York.

National Statistical Institute 2023. *Digital skills statistics 2023*, NSI, Sofia, viewed 15 January 2026, https://www.nsi.bg.

OECD 2019. *Measuring the digital transformation: A roadmap for the future*, OECD Publishing, Paris, viewed 15 January 2026, https://www.oecd.org/digital/measuring-the-digital-transformation-9789264311992-en.htm.

OECD 2020. *Digital economy outlook 2020*, OECD Publishing, Paris, viewed 15 January 2026, https://www.oecd.org/digital/oecd-digital-economy-outlook-2020-bb167041-en.htm.

OECD 2021. *Digital economy outlook 2021*, OECD Publishing, Paris, viewed 15 January 2026, https://www.oecd.org/digital/oecd-digital-economy-outlook-2021-78a84dc3-en.htm.

OECD 2023. *OECD digital economy outlook 2023*, OECD Publishing, Paris, viewed 15 January 2026. https://www.oecd.org/digital/oecd-digital-economy-outlook-2023-949cda1c-en.htm.

Porter, M. E. 1990. *The competitive advantage of nations*, Free Press, New York.

Romer, P. M. 1990. Endogenous technological change, *Journal of Political Economy*, vol. 98, no. 5, pp. S71–S102.

Schwab, K. 2016. *The Fourth Industrial Revolution*, World Economic Forum, Geneva.

World Bank 2021. *World development report 2021: Data for better lives*, World Bank, Washington, DC.

World Economic Forum 2020. *The future of jobs report 2020*, World Economic Forum, Geneva.

За контакти:
Lyubomira Spasova, Chief Asst. Prof., DSc
Stara Zagora, Students' Campus
Ел. поща: lyubomira.spasova@trakia-uni.bg