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ДИГИТАЛНАТА ТРАНСФОРМАЦИЯ КАТО ФАКТОР ЗА ПРОМЯНА НА КОНКУРЕНТОСПОСОБНОСТТА НА БЪЛГАРСКАТА И ЕВРОПЕЙСКАТА ИКОНОМИКА

DIGITAL TRANSFORMATION AS A FACTOR RESHAPING THE COMPETITIVENESS OF THE BULGARIAN AND EUROPEAN ECONOMY

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Abstract: The article examines digital transformation as a structural factor reshaping the determinants of competitiveness in the Bulgarian and European economy. The analysis proceeds from the understanding that competitiveness is no longer based predominantly on labour costs, traditional capital accumulation or access to established markets, but increasingly on the capacity to deploy digital technologies, develop human capital, integrate data into managerial and production processes, and sustain innovation dynamics. The paper combines a concise conceptual discussion with a comparative empirical profile of Bulgaria and the European Union based on recent indicators on digital skills, ICT specialists, cloud computing, artificial intelligence, data analytics, e-commerce, R&D expenditure, e-government and the digital intensity of enterprises. The results show that the EU as a whole continues to advance in business digitalisation and innovation capability, yet remains below some of its 2030 digital targets. Bulgaria, in turn, possesses relatively good connectivity conditions and a dynamic ICT niche, but continues to lag behind the EU average in the diffusion of advanced digital technologies, in adult learning participation, in the innovation base of firms and in the broad digital readiness of the labour force. The article argues that the central challenge for Bulgaria is not the absence of digital potential, but the limited depth of its economic absorption. Without stronger investment in skills, enterprise transformation, research and innovation linkages, digitalisation will remain uneven and will not be converted into a stable source of higher productivity and long-term competitiveness.
Keywords: digital transformation; competitiveness; Bulgaria; European Union; digital skills; innovation; enterprises.
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Introduction

Over the last decade, digitalisation has evolved from a technological trend into a key structural factor reshaping the way economies build and sustain competitive advantages. Within the European Union, this process is understood not merely as technological upgrading but as part of a broader transformation of production, innovation, the labour market and public governance. Contemporary literature

increasingly demonstrates that the competitiveness of European economies is linked not only to traditional macroeconomic indicators, but also to the level of digitalisation and innovation capacity (Marti and Puertas, 2023; Fura, Karasek and Hysa, 2025).

The topic is particularly important for Bulgaria. The country possesses certain advantages — relatively well-developed connectivity, the presence of a dynamic ICT sector, a high share of women among ICT specialists, and participation in European programmes supporting the digital transition. At the same time, a number of comparative indicators show that Bulgaria remains below the EU average in basic digital skills, the adoption of cloud services, the use of artificial intelligence, and expenditure on research and development (European Commission, 2025a; European Commission, 2025b; Eurostat, 2026a). This asymmetry between isolated zones of progress and broader structural lag is typical of peripheral and catching-up economies and reminds us that European transformations often unfold under unequal starting positions and different capacities for convergence.

The aim of the present study is to analyse digital transformation as a factor in the transformation of the competitiveness of the Bulgarian and European economy. The main thesis is that digitalisation is no longer a peripheral element of modernisation; rather, it is changing the very model of competitiveness by placing human capital, data, digital business models, innovation and the institutional capacity for accelerated adaptation at the centre. Methodologically, the article combines a concise conceptual analysis with a comparative review of recent indicators for Bulgaria and the EU, based primarily on Eurostat, the European Commission, the National Statistical Institute and the European Innovation Scoreboard.

1. Digital Transformation as a New Determinant of Competitiveness

In classical interpretations, competitiveness is associated above all with productivity, cost efficiency, the degree of international openness and the capacity to sustain long-term growth. Under conditions of digital transition, this logic broadens. Digital transformation changes the very mechanisms through which economies organise value creation, knowledge accumulation and the diffusion of innovation. Research on the EU shows that digitalisation and innovation are closely interconnected, and that countries with stronger digital capacities usually occupy more favourable positions in European competitiveness rankings (Marti and Puertas, 2023; Hernandez-de-Rojas, Rodriguez-Pita and Perez-Martinez, 2024).

The first major channel is productivity. Digital technologies enable the automation of routine operations, better resource planning, tighter integration between business units, and more accurate management of value chains. The second channel is innovation capacity. Digital transformation not only accelerates the introduction of new products and processes, but also changes the way national innovation systems convert resources into outcomes. The analysis by Duarte and Carvalho (2024) shows that the level of national digital transformation moderates the configurations of innovation inputs that generate innovation outputs in EU member states. The third channel is human capital. Digitalisation requires not simply access to technologies, but the ability of the labour force and managerial teams to absorb and use them effectively, which makes skills, lifelong learning and organisational capabilities key determinants of competitiveness (Hernandez-de-Rojas, Rodriguez-Pita and Perez-Martinez, 2024).

Digital transformation should therefore not be viewed as a technical add-on to an already existing growth model. It changes the very sources of competitiveness. Economies that lag in the widespread adoption of digital solutions, in the development of ICT talent, and in the ability to convert digital infrastructure into innovation and production outcomes risk remaining in lower segments of the European economy. This is especially true for small and medium-sized enterprises, where constraints related to knowledge, managerial capacity, and access to resources often slow down digital restructuring (Clemente-Almendros, Nicoara-Popescu and Pastor-Sanz, 2024).

2. Bulgaria and the EU: Empirical Dimensions of Digital Competitiveness

Recent data show that, at the European level, digital transformation is advancing, though with considerable differences across member states. Among people aged 16-74, the share with at least basic digital skills reached 60% in the EU in 2025, whereas in Bulgaria it was 38% (Eurostat, 2026a). This is a key indicator because it measures not only individual digital literacy, but also the breadth of the social

base on which enterprises and institutions can build new digital processes. A similar picture emerges with regard to ICT specialists. In 2024 they accounted for 5.0% of total employment in the EU, while in Bulgaria the share was 4.6%, that is, below the Union average, although displaying an upward trend in the longer run (Eurostat, 2025a; Eurostat, 2026e). An important positive nuance is that Bulgaria stands out with a relatively high share of women among ICT specialists — 27.0% compared with an EU average of 19.5% — indicating the presence of a specific talent potential (Eurostat, 2025a).

Nevertheless, competitiveness depends not only on the availability of ICT professionals, but on the extent to which digital solutions have penetrated economic activity. It is precisely here that the differences between Bulgaria and the EU are most pronounced. In 2025, 52.74% of enterprises in the EU used paid cloud services, while in Bulgaria the share was only 17.83%. In the use of AI technologies, the gap was 19.95% versus 8.55%, and for data analytics it was 39.85% versus 27.06% (Eurostat, 2026b; Eurostat, 2026c). These differences are not merely technical. They signal weaker diffusion of the digital solutions through which firms reduce transaction costs, increase production flexibility and improve data management. In the literature, precisely this type of business digitalisation is seen as a channel through which the financial performance and resilience of European SMEs can be improved (Savvakis, Kenourgios and Trakadas, 2024).

Table 1. Main Indicators of Digital Transformation and Competitiveness: Bulgaria and the EU

Indicator	EU	Bulgaria	Source and interpretation
People with at least basic digital skills, 2025 (%)	60.0	38.0	Breadth of digital human capital; lower readiness for large-scale digital adaptation
ICT specialists in total employment, 2024 (%)	5.0	4.6	Labour-market capacity for technological transformation
Enterprises purchasing paid cloud services, 2025 (%)	52.74	17.83	Extent of digitalisation of business processes
Enterprises using AI, 2025 (%)	19.95	8.55	Diffusion of advanced digital technologies
Enterprises carrying out data analytics, 2025 (%)	39.85	27.06	Use of data for management and decision-making
Share of turnover from e-sales, 2024 (%)	19.49	7.63	Digital market access and monetisation of online sales
R&D expenditure (% of GDP), 2024	2.24	0.77	Innovation and technological base
Use of e-government services by the population, 2025 (%)	71.9	35.9	Quality of the digital institutional environment

Source: Eurostat (2025a; 2025c; 2026a; 2026b; 2026c; 2026d; 2026e), European Commission (2025c), NSI (2025; 2026)

The comparison shows that Bulgaria's lag is not confined to a single indicator, but affects several elements of digital competitiveness simultaneously. Particularly revealing is the fact that while 63.57% of enterprises in the EU use social media, only 41.51% do so in Bulgaria, and in electronic commerce the share of enterprises with online sales also remains below the EU average (Eurostat, 2025c; Eurostat, 2026c). It follows that the problem is not only the pace of technological upgrading, but also the more limited restructuring of business models. This corresponds to findings for Central and Eastern Europe, according to which countries in the region differ substantially in the degree of business digitalisation and innovation, with Bulgaria positioned more among the lagging groups than among the leaders (Tutak, 2024).

The picture becomes even clearer when digital indicators are linked to the innovation structure of the economy. Expenditure on research and development in the EU reached 2.24% of GDP in 2024, whereas in Bulgaria it was 0.77% (Eurostat, 2025d; NSI, 2025). According to the European Innovation

Scoreboard, Bulgaria remains an 'emerging innovator', reaching only 45.8% of the EU average level in 2025 and ranking 26th among the member states (European Commission, 2025c). Indicators of business digital intensity also point to a substantial deficit: Bulgaria's Digital Intensity Index was 17.6 compared with an EU average of 34.2 in 2024 (European Commission, 2025c). This matters because digital transformation becomes sustainable only when it is underpinned by innovation capacity, investment in business upgrading, and functioning linkages between science, technology and entrepreneurship.

Table 2. Selected Structural Indicators of Bulgaria's Position in the European Economy

Indicator	Bulgaria	EU	Significance for competitiveness
GDP per capita (average 2022–2024, EU=100)	64	100	Shows the unfinished character of catching-up
Average annual GDP growth (2022–2024, %)	2.3	0.8	Higher growth, but from a lower base
Employment in manufacturing (2022-2024, %)	17.9	15.6	Preserved industrial weight
Employment in high- and medium-high-tech manufacturing (%)	24.2	38.1	Limited participation in higher-technology segments
Employment in knowledge-intensive services (%)	21.8	28.5	Weaker development of knowledge-intensive services
Digital Intensity Index, 2024	17.6	34.2	Low digital maturity of enterprises
Innovation public procurement (% of total), 2024	2.0	9.2	Weak public stimulus for innovation
Adult participation in learning, 2022 (%)	9.5	39.5	Low capacity for reskilling and adaptation

Source: European Commission (2025a; 2025c; 2025d), Eurostat (2026e), NSI (2025)

These structural indicators allow for a deeper interpretation. Bulgaria has a GDP per capita equal to 64% of the EU average, together with a relatively higher average growth rate of 2.3% over the period 2022–2024, yet it still records lower labour productivity and a limited capacity to convert digital connectivity into broader technological modernisation (European Commission, 2025a; Eurostat, 2026e). In other words, the country exhibits elements of catching-up development, but not a sufficiently strong structural base to use the digital transition as a sustainable source of competitive advantage. In this sense, the relationship between digitalisation and competitiveness should be understood not only through the existence of infrastructure, but through the deeper connection among knowledge, innovation, organisational capacity and economic outcomes (Marti and Puertas, 2023; Duarte and Carvalho, 2024).

An important additional element is adult participation in learning. According to the Education and Training Monitor for 2022, adult participation in education and training in Bulgaria was 9.5%, compared with an EU average of 39.5% (European Commission, 2025d). This is a particularly significant constraint, because the digital transition is not a one-off act of technological equipment acquisition but a process of continuous upgrading of competencies. If the labour force does not renew its skills, digital transformation becomes concentrated in narrow segments of the economy and creates a two-speed development path between more modern and more lagging firms, sectors and regions.

In addition, the data on the use of electronic public services show that the institutional environment also remains unevenly digitalised. In 2025, 71.9% of people in the EU used websites or applications of public authorities, whereas in Bulgaria the share was significantly lower (Eurostat, 2026d; NSI, 2026). This matters because the quality of digital public services affects administrative costs, access to information and the wider environment for business operations. European literature increasingly treats digitalisation not as an isolated firm-level process but as part of a broader ecosystem in which public institutions, infrastructure, skills, and innovation networks interact and jointly shape competitiveness (Fura, Karasek and Hysa, 2025).

3. Main Constraints and Opportunities for the Bulgarian Economy

The analysis allows several major constraints to be identified. First, Bulgaria has a narrower base of digital skills than the EU average. This is not only an educational issue, but a limitation on productivity, on firms' ability to adopt new solutions, and on the capacity of the labour force to adapt to technological restructuring. Research on European countries shows that the relationship between digitalisation, innovation and human capital is systemic, and that digital progress is difficult to achieve without a broader educational and training base (Hernandez-de-Rojas, Rodriguez-Pita and Perez-Martinez, 2024). Second, business digitalisation in Bulgaria remains limited, especially in more sophisticated applications such as AI, data analytics and integrated digital systems. This is particularly problematic in an economy dominated by small and medium-sized enterprises, since firm size, professionalisation and international orientation are important determinants of successful digital transformation among SMEs (Clemente-Almendros, Nicoara-Popescu and Pastor-Sanz, 2024).

Third, the innovation base of digital transformation remains underdeveloped. The low level of R&D expenditure, weak results on the Digital Intensity Index and Bulgaria's lower position in the European Innovation Scoreboard show that digitalisation is still not organically connected to a sufficiently strong system for generating and commercialising knowledge (European Commission, 2025c; NSI, 2025). This is an important problem because studies of national innovation systems show that digital transformation is strongest where a denser network already exists between knowledge institutions, enterprises and public bodies (Duarte and Carvalho, 2024). In addition, regional studies for Europe indicate that new digital technologies are more easily absorbed in regions that already possess related digital capabilities, and that greater digital complexity is associated with higher labour productivity (Apostol and Hernandez-Rodriguez, 2025).

Alongside these constraints, the opportunities should also be emphasised. Bulgaria has a relatively good infrastructural base and participates in European investment instruments for the digital transition. The Digital Decade report for the country underlines that in some areas — for example, connectivity and certain public digital services — progress is observable (European Commission, 2025b). If this progress is more strongly linked to industrial policy, digital skills development, support for SMEs and stimulation of R&D, digital transformation may become a genuine instrument of catching-up development rather than merely a source of partial improvements. In a broader European context, this is consistent with the understanding that the digital and green transition should be treated as interconnected policies, not as separate agendas without a common strategic logic (Gao, 2025).

From the perspective of economic policy, several conclusions follow. Digital policies need to be more tightly connected with employment, education, industrial development and innovation policies. The broad upgrading of digital skills, especially among adults and in peripheral regions, should become a central priority. At the same time, SMEs should receive easier access to advisory, financial and technological support for the adoption of cloud, data analytics, cybersecurity, and AI solutions. Finally, the public environment should strengthen the demand for innovation through digital public services, innovation-oriented public procurement and stronger linkages between universities, research organisations and firms. Without such an integrated policy, digital transformation risks remaining sectorally and socially limited.

4. Political-Economic Dimensions of Digital Competitiveness

For Bulgaria, digital transformation matters not only as technological modernisation, but also as an instrument for changing the country's place in the European division of labour. If digitalisation remains concentrated mainly in a limited circle of high-technology firms and in a few urbanised centres, it will not generate a sufficiently broad improvement in national competitiveness. Conversely, if digital technologies penetrate more deeply into production, services, public administration and the skills system, their effect can become more structural and can be reflected in productivity, firm resilience, and quality of employment. This distinction between partial and systemic digitalisation is especially important for catching-up economies in the EU (Tutak, 2024; Fura, Karasek and Hysa, 2025).

At EU level, this logic is increasingly linked to concepts such as technological sovereignty, strategic autonomy and the resilience of value chains. The Bulgarian economy is directly affected by this shift, because its competitive model cannot sustainably rely only on relatively low labour costs. Under the dual digital and green transition, growth increasingly depends on the ability of economies to coordinate technological modernisation, innovation policy, and human capital development. In this sense, the European framework of twin transitions is directly relevant to the assessment of Bulgarian competitiveness (Gao, 2025).

In this context, policy on digital competitiveness should also be understood as productivity policy. The data from the European Innovation Scoreboard, according to which Bulgaria reaches only 45.8% of the EU average level of innovation performance in 2025, show that the country has still not entered the group of economies that systematically convert knowledge into market outcomes (European Commission, 2025c). A similar conclusion is supported by empirical studies on European SMEs, which show that digitalisation has a tangible positive effect on financial performance, but that this effect does not arise automatically; it requires firms to integrate technologies, managerial practices, and organisational change (Savvakis, Kenourgios and Trakadas, 2024).

Conclusion

Digital transformation is already among the main factors restructuring the competitiveness of the European economy. It changes the logic of growth by shifting the focus away from traditional advantages based primarily on price and resource endowment, and towards advantages grounded in knowledge, skills, data, innovation and organisational adaptability. Contemporary EU-focused literature confirms that digitalisation is closely linked both to the innovation capability of economies and to their position within the European competitive hierarchy (Marti and Puertas, 2023; Duarte and Carvalho, 2024).

The principal challenge for the Bulgarian economy is therefore not simply technological catching-up, but the construction of a deeper capacity for the economic absorption of digital change. This implies the development of human capital, broader business digitalisation, stronger links between R&D and business, and more coherent coordination between digital, industrial, educational and innovation policies. Without such coordination, the digital transition risks remaining partial and uneven; with more successful coordination, it can become a genuine instrument for higher productivity, a better position in European value chains, and more sustainable competitiveness (Apostol and Hernandez-Rodriguez, 2025; Gao, 2025).

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