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MODERN PARADIGM OF THE EU SUSTAINABLE COMPETITIVENESS

Abstract

The article explores the combined development of digital transformation and the green transition as a key foundation of modern paradigm of the EU sustainable competitiveness. Strengthening competitiveness has become one of the EU's strategic priorities for 2024–2029, and the synergy between sustainability goals and technological progress is seen as a major driver of innovation, productivity and economic resilience. The European Green Deal, the Clean Industrial Deal and the Digital Decade Policy Programme 2030 highlight that climate neutrality and sustainable growth cannot be achieved without digital technologies. Smart grids, IoT systems, artificial intelligence, cloud computing and digital twins optimise energy and resource use, reduce emissions and support the circular economy. Therefore, the twin transition forms a new paradigm of EU competitiveness,

where sustainable development, innovation and resilience are mutually dependent components.

The strategic importance of the twin transition for Ukraine is emphasised, especially in the context of post-war recovery and European integration. Ukraine demonstrates strong advances in digital governance – particularly the Diia platform – and is progressing toward greener energy systems, including decentralised renewable solutions. Digitalisation also ensures transparency in reconstruction processes and strengthens national security. To fully benefit from the twin transition, Ukraine must invest in digital skills, reinforce cyber-resilience, expand access to EU green financing and support innovation ecosystems.

The study concludes that digital and green transformations are mutually reinforcing processes that define a new paradigm of competitiveness. For the EU, this synergy enhances sustainability, innovation capacity and strategic autonomy. For Ukraine, adoption of the twin-transition model is a critical pathway to modernisation, resilience and successful integration into the European Union.

Key words: digital transformation, green transition, paradigm, European Union, sustainable competitiveness, twin transition, Ukraine’s post-war recovery.

Problem statement

Boosting Europe’s competitiveness has become particularly relevant due to its inclusion in the seven strategic priorities of the European Union, identified by the European Commission for 2024-2029 [1]. The goal of strengthening the EU competitiveness will be ensured due to the synergy of the green transition and digital transformation.

The ambitious European Green Deal [2] and the Green transition policy, as well as the new Clean Industrial Deal, have become powerful innovative tools for ensuring the EU's sustainable competitiveness. These tools are designed to respond to modern global challenges, such as climate change, resource scarcity

and environmental threats to humanity. The green transition generates demand for innovative digital solutions, creating a mutually reinforcing cycle of technological and environmental progress.

Digital transformation in modern conditions is considered a key factor in socio-economic development. For the European Union, the formation of a digital economy and a digital society is one of the strategic tasks that should ensure the sustainability of economic growth, innovative development and competitiveness. In 2021, the European Commission proposed the Digital Decade program [3], which set specific goals for the digital transformation of Europe by 2030. Also, in the EU strategic vision, digitalisation is not only a technological trend but a key driver enabling the achievement of climate neutrality, energy security and sustainable growth.

The twin transition as the simultaneous advancement of digital transformation and the green transition – has become a defining pillar of the modern paradigm of the European Union sustainable competitiveness.

Analysis of recent research and publications

Modern researchers have examined the European Green Deal as a comprehensive long-term strategy for the economic and social transformation of the European Union. Jiří Malý [4] compared the expected benefits and potential risks of the European Green Deal, analysed the differences in the views and approaches of EU Member States regarding its implementation, and discussed the possible impacts of the Green Deal on the EU's competitiveness in the global economy.

The impact of the European Green Deal on competition and entrepreneurship in the EU is the focus of A. Bogoslov, A. Lungu, E. Stoica, and M. Georgescu [5]. These researchers critically assessed both the weaknesses of the European Green Deal, particularly the potential negative effects on entrepreneurial activity due to excessive emphasis on the environmental dimension contrary to

market laws, and its long-term importance for strengthening the EU's competitiveness.

K. Falkowski [6] explored the important research issue of the potential impact of implementing the principles of the European Green Deal on the EU's sustainable competitiveness. He demonstrated that the Green Deal can enhance the EU's sustainable competitiveness in the long run, despite the costs associated with the green and digital transformation.

In EU policy documents, digital transformation is described as a structural transition of the economy and society by 2030, with clear objectives and measurable targets set out in the *Digital Decade Policy Programme 2030*, designed to accelerate and shape a successful digital transformation of the Union [7]. I. Benedetti, G. Guarini, T. Laureti consider digitalization in Europe as a potential driver of energy efficiency for the twin transition policy strategy [8].

At the same time, the synergistic impact of the green transition and digital transformation on the EU's competitiveness as well as Ukraine's economic recovery context requires more in-depth study.

Purpose of the article is to prove that the synergy between digital transformation and the green transition can serve as a powerful multiplier for EU sustainable competitiveness, as well as provide a new basis for Ukraine's economic recovery.

Presentation of the main material of the study

The combination of digital and green transitions is economically justified and embedded in EU policy frameworks. In 2021, the European Commission proposed the Europe's Digital Decade programme [7], which set specific targets for the digital transformation of Europe by 2030. This programme is guided by the EU's digital transformation roadmap – the "2030 Digital Compass" [18]. The digital transformation focuses on building an innovative, human-centered and secure digital ecosystem, and includes a comprehensive set of measures aimed at the

establishment of a single digital space. These measures encompass: the development of digital skills among the population, the creation of a secure and efficient digital infrastructure, support for the digital transformation of the business sector, and ensuring the digitalisation of public administration and public services [7].

The EU's Digital Single Market Strategy [18] was launched in 2015 and aimed to promote economic growth, job creation, competition, investment and innovation in the EU, based on three key pillars:

1. Better access for consumers and businesses to digital goods and services across Europe;
2. Creating the right and equal conditions for the development of digital networks and innovative services;
3. Maximising the growth potential of the digital economy.

In the Digital Decade Policy Programme 2030, digital transformation is identified as a key factor in achieving climate neutrality [7]. The European Green Deal [2] highlights the role of digitalisation in reducing emissions, optimising energy consumption and ensuring a circular economy. The European Green Deal and the Fit for initiative underline that cutting emissions by 55% by 2030 requires digital solutions such as smart grids, digital twins, and IoT applications in transport and construction, among others [2; 9]. The REPowerEU Plan also provides for the digitalisation of the energy system to accelerate the shift to renewable sources and increase energy efficiency [10].

The main challenge lies in bridging digital skills gaps and introducing digital technologies across all sectors of the economy and society while simultaneously limiting the growth of the energy intensity of digital infrastructure. Rising energy consumption can offset climate benefits and therefore requires comprehensive energy-efficiency measures to sustain the digital sector. Ultimately, this calls for the close integration of the digital and green transitions.

EU policy frameworks, including the Digital Decade Policy Programme 2030 [7], the European Green Deal [2], Fit for 55 [9] and the REPowerEU Plan [10], consistently highlight that climate goals cannot be achieved without digital technologies. Smart grids, advanced data spaces, IoT systems, digital twins and automated transport solutions optimise energy consumption, reduce emissions, modernise infrastructure and enhance economic resilience. These tools enable more efficient integration of renewable energy, support real-time monitoring of climate risks, and strengthen cross-sectoral coordination in industry, transport, energy and construction.

Over the past decade, digital transformation within the EU has evolved from basic adoption of digital tools into a systemic redesign of value chains, business models and public administration. By 2024, almost three-quarters of SMEs had reached at least a basic level of digital intensity, and the use of AI, cloud computing and big-data analytics continues to expand [11]. The Recovery and Resilience Facility has further accelerated these processes, with more than 25% of its funding directed toward digitalisation [12]. However, persistent challenges remain, including digital skills shortages, uneven levels of digital maturity across Member States and the increasing energy consumption of data centres and digital infrastructure. These challenges require balanced strategies that combine innovation with energy efficiency.

The green transition reinforces technological modernisation by stimulating demand for clean, efficient and transparent solutions. In the energy sector, digital monitoring tools, automated control systems, smart meters and predictive modelling tools support the integration of renewable energy and increase the flexibility of energy systems. In the transport sector, intelligent routing, multimodal mobility platforms and the European Mobility Data Space contribute to reducing congestion and emissions. The building sector, responsible for nearly 40% of EU energy use, benefits from digital optimisation systems that improve

heating, cooling and electricity efficiency. The introduction of Digital Product Passports [13] in industry enhances transparency and facilitates the shift toward circular production models.

Therefore, the twin transition forms a new paradigm of EU competitiveness, where sustainable development, innovation and resilience are mutually dependent components. Digitalisation improves productivity and economic efficiency, while the green transition guarantees long-term environmental and energy security.

For Ukraine, the twin transition has strategic significance in the context of post-war reconstruction, integration into the European Union and the strengthening of economic and energy resilience. Ukraine has demonstrated considerable progress in the digital domain: in 2022, the country joined the Digital Europe Programme, gaining access to EU initiatives in cybersecurity, digital innovation and digital-skills development [14]. The Diia platform, widely recognised as one of the most advanced digital public service systems, provides more than 140 e-services and has become a symbol of resilience and administrative continuity during wartime. This experience positions Ukraine as a valuable digital partner for the EU.

Simultaneously, Ukraine is advancing its green transition, despite large-scale destruction caused by the war. The share of renewable energy increased from 3.9% in 2014 to 9.2% in 2020, and the ambitious “30 GW by 2030” strategy reflects the country’s intention to become a contributor to Europe’s future energy security [15]. The digitalisation of energy systems, transparent reconstruction monitoring mechanisms and the introduction of smart-grid solutions are essential for building a resilient and decentralised energy sector.

The synergy of digital and green developments also strengthens Ukraine’s foreign-policy position. Digital tools allow transparent resource management and enhance accountability of reconstruction processes, while innovations in cybersecurity and artificial intelligence have already proven to be strategic assets

in Ukraine's defence. The combination of technological and green priorities therefore becomes a comprehensive strategy for recovery, integration and long-term competitiveness.

To fully benefit from the twin transition, Ukraine should focus on several key policy areas. First, investment in digital skills is essential: only about 54% of Ukrainian citizens possess basic digital competencies, compared to over 70% in the EU [16; 17]. Closing this gap is a prerequisite for integration into the European digital market. Second, cybersecurity of critical infrastructure must be strengthened, including through the development of Security Operations Centres and closer integration with European cybersecurity mechanisms. Third, the implementation of green transition goals requires access to EU financial instruments and the development of decentralised renewable energy solutions. Fourth, innovative ecosystems uniting business, science and government should be supported in order to promote technologies at the intersection of digital and green domains. Finally, strategic partnership with the EU should be deepened to ensure Ukraine's involvement in shaping the future of the European digital and climate architecture.

Conclusions

The synergy between digital transformation and the green transition in the European Union have been considered. It is proven that the twin transition represents a new model of European competitiveness, where digital and green transformations function as interconnected drivers of growth, sustainability and resilience.

For Ukraine, the adoption of this model is not only crucial for recovery and modernisation but also opens the path to successful integration into the EU and long-term economic security. To maximise the benefits of the twin transition, Ukraine should focus on several key policy directions:

- Investing in digital skills and human capital.

- Strengthening cyber-resilience in critical sectors.
- Using the green transition as a foundation for energy independence.
- Supporting innovative ecosystems.
- Deepening strategic partnership with the EU.

Thus, the digital-green transformation should become a key driver of Ukraine's post-war recovery, integration into the EU, acceleration of economic growth and boosting sustainable competitiveness.

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