DOI: 10.26565/2786-4995-2025-2-14
УДК: 658:004

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The Impact of Industry 5.0 on Enterprise Resilience in the Digital Environment

Abstract. This article investigates the impact of Industry 5.0 on enterprise resilience within the digital environment, addressing a highly relevant topic amid the global digital transformation and sustainability challenges. The focus is on a new paradigm that transcends Industry 4.0's automation, emphasizing human-centricity, corporate social responsibility, and ethical value creation in enterprise management. The purpose of this study is to conduct a comprehensive analysis of Industry 5.0's potential as a driver of financial, social, and environmental resilience in enterprises. The object of the study includes businesses at various stages of digital maturity and innovation adoption. The methodological framework combines systems analysis, comparative assessment, and structural-functional approaches. Additionally, the study employs market analytics, secondary data, and international case studies from leading adopter countries. Findings reveal that although the global Industry 5.0 market is projected to grow rapidly (CAGR 29.7% by 2030), real-world implementation is progressing slowly. Smart inventory systems, mass customization, and intelligent production workflows have demonstrated a positive influence on corporate financial stability. However, the lack of sufficient empirical data highlights the need for further research using firm-level data to evaluate actual changes in resilience performance. The practical value of the study lies in developing methodological guidelines for digital transformation policies, designing adaptive management models, and building tools to assess enterprise sustainability in the digital age. The study concludes that Industry 5.0 is not merely an extension of previous industrial revolutions but a transformative concept aimed at fostering a sustainable, human-centric industrial future.

Keywords: *Industry 5.0, sustainability, human-centered technologies, enterprise, sustainable development, digital transformation.*

Formulas: 0; fig.: 2; tabl.: 2; bibl.: 20.

JEL Classification: O33, Q55, L26

For citation: Gorobynskaya M., Krivtsova T. The Impact of Industry 5.0 on Enterprise Resilience in the Digital Environment. Financial and Credit Systems: Prospects for Development. №2(17) 2025. P. 167-179. DOI: https://doi.org/10.26565/2786-4995-2025-2-14

Introduction. The global economy is undergoing a significant transformation, driven by the rapid adoption of advanced technologies and evolving societal needs. From the mechanized processes of the first industrial revolution to the digitalization that characterizes Industry 4.0 (I4.0), the world has witnessed unprecedented changes in production practices. Industry 5.0 is becoming increasingly critical and this revolution marks a turning point from an industrial approach that focuses on efficiency and automation to a paradigm that prioritizes human-machine collaboration, innovation, and harmonization with the environment. This study examines the dynamic intersection between Industry 5.0 and sustainability, emphasizing how this evolution aims to integrate human creativity and expertise with advanced technological capabilities. The study identifies emerging trends and challenges, focusing on achieving a sustainable future through practices that balance economic growth and sustainability management. This article explores the untapped potential of Industry 5.0 technologies in driving sustainability initiatives.

Literature review. A comprehensive literature review shows that several systematic literature reviews provide a solid basis for elucidating the significant differences and progress between these two industrial revolutions. Several studies emphasize the shift from automation and digitalization in Industry 4.0 to human-machine collaboration in Industry 5.0. Additional systematic literature reviews have emphasized the emphasis on sustainability, human-centeredness, and resilience in Industry 5.0. Among the works on this topic are studies by such authors as L. Nechyporuk, V. Rudan, S. Pidhaits, M. Nagara, N. Ryvak, as well as international studies by authors such as Rame, R., and Sudarno, S. (2024), Morteza Ghobakhloo (2022), Md. Abdus Shabur, Abid Shahriar & Mst. Anjuman Ara (2025).

Today, there is some general agreement on the core values of Industry 5.0, at least on the three pillars of economic sustainability, environmental sustainability, and human-centeredness (A. Akundi 2022). The research of Md. Abdus Shabur contributes to the existing literature by providing a comparative analysis of Industry 4.0 and Industry 5.0, testable hypotheses for future empirical validation, and insights into policies and industrial strategies for a smooth transition. The author concludes that Industry 5.0 is not just an extension of Industry 4.0, but a transformative paradigm aimed at promoting a sustainable, human-centered industrial future. Also worth noting is the study by Morteza Ghobakhloo et al. The researchers believe that Industry 5.0 innovations have the potential to go beyond the profit-oriented productivity of Industry 4.0 and contribute to sustainable development goals, such as human-centeredness and socio-environmental sustainability. Research by Ukrainian scientists is important in analyzing the potential of Industry 5, especially given the economic and political factors. For example, Nechyporuk and co-author (2024) note that Industry 5.0 has significant potential to optimize resource use, improve socio-economic indicators, so that enterprises can reduce costs and increase their competitiveness in the global market.

It is also noted that Industry 5.0 contributes to the creation of new jobs, while requiring new skills and competencies from employees. M.B. Nagara describes the impact of Industry 5.0 on the formation of business models while meeting the needs and interests of consumers, as well as ensuring environmental sustainability and resource conservation. The author outlines the determinants of the progress of business models in accordance with Industry 5.0 and establishes that the rapid spread of Industry 5.0 technologies leads to the formation of effective business models based on intellectualization, socialization and environmentalization. Rudan V. Y., Pidhaits S. V. prove how Industry 5.0 technologies can help overcome current challenges and contribute to the restoration of production facilities, ensure the continuity of business processes, increase the country's defense capability and create new opportunities for the development of enterprises in the context of military operations.

H. Ryvak substantiates the expediency of both further research and implementation of the Industry 5.0 concept and reorientation of production and business activities towards human-centeredness, strengthening sustainability (through, in particular, careful planning of stabilization measures in case of disruption of global value chains - from the factory to the network supplier,

transport channels, regulatory and geopolitical changes), ensuring sustainability by rethinking by producers their impact on natural resources through the expansion of regulatory and legislative frameworks.

Despite the theoretical foundations and ambitious goals of Industry 5.0, there is still a significant gap in the practical assessment of its effectiveness. Unlike Industry 4.0, which has been thoroughly studied and evaluated for its impact on firm profitability and productivity (Grybauskas, A., et al., 2022), Industry 5.0 lacks comprehensive research that examines its tangible contribution to sustainability and social well-being. The theoretical basis for Industry 5.0 is undoubtedly strong, building on the achievements of Industry 4.0 and advocating a paradigm shift that aligns industrial development with environmental and societal concerns (Ivanov, D., 2023).

However, Industry 5.0 requires a fundamental overhaul of business models, supply chains, and organizational structures, which can be challenging for established industries that have long operated within a profit-driven framework (Renda, A, et al., 2022). The voluntary implementation of Industry 5.0 principles by enterprises remains uncertain, as it requires significant investment and restructuring without immediate guarantees of profit.

Thus, the literature review covers both the theoretical foundations of the impact of Industry 5.0 on the sustainability of enterprises and the applied aspects of the introduction of human-centered and digital technologies into production and management practices. This creates a comprehensive basis for further analysis of the transformation of development strategies in the context of the transition to Industry 5.0.

Purpose, objectives and research methods. The purpose of this study is to comprehensively analyze the impact of Industry 5.0 on the sustainability of enterprises, identify key trends, and form a generalized view of the transformation of the technological state in the context of a human-centered digital economy. One of the main tasks is to systematize theoretical approaches to understanding the sustainability of companies in the transition to Industry 5.0, as well as to identify the leading countries conducting research in this area.

Particular attention is paid to the analysis of challenges and opportunities for enterprises in the context of the introduction of innovative and human-centered technologies. To achieve this goal, the methods of systematization and generalization, as well as elements of comparative analysis of the leading countries in the implementation of Industry 5.0 are applied. The intersection of Industry 5.0 and sustainable development is explored, focusing on how new technologies and environmentally friendly practices can coexist for a more sustainable future. The use of advanced technologies to increase sustainability in manufacturing and energy addresses the challenges and opportunities that Industry 5.0 presents in achieving economic, environmental and social goals, as well as the importance of resilience and cognitive adaptation in future production processes.

Research results. From the mechanized processes of the first industrial revolution to the digitalization that characterizes Industry 4.0 (I4.0), the world has witnessed unprecedented changes in manufacturing practices. As we move to the next phase, Industry 5.0 (I5.0), a paradigm shift is underway that combines technological innovation with human-centered approaches, seeking to address the shortcomings of I4.0 while promoting sustainability across all dimensions. Industry 5.0.- It is more than just a continuation of previous industrial revolutions and represents a new era in which technology and human creativity collaborate to achieve personalized, efficient, and sustainable production. Industry 5.0 brings together advanced technologies such as artificial intelligence (AI), the Internet of Things (IoT), collaborative robotics (cobots), and big data analytics. Whereas I4.0 focused on automation and data-driven efficiency, I5.0 emphasizes the importance of human involvement in the manufacturing process, mass customization, and a strong commitment to sustainability. A key principle underpinning Industry 5.0 is the Triple-Bottom-Line (TBL) concept of sustainability, which balances economic, social and environmental concerns to ensure long-term viability. By reintegrating people into the production process and promoting ethical, resource-efficient practices, I5.0 offers the opportunity to address not only technological

challenges, but also global issues such as climate change, resource depletion, and job displacement.

Adopting the principles of Industry 5.0 requires a paradigm shift in the way businesses operate (Turner, C. and Oyekan, J., 2023). This requires a controlled and well-managed integration of advanced technologies that optimize resource use, reduce waste, and promote socially and environmentally responsible practices (Xian, W., 2024).

The introduction of Industry 5.0 is based on the observation or assumption that Industry 4.0 focuses less on the original principles of social justice and sustainability and more on digitalization and artificial intelligence-driven technologies to increase production efficiency and flexibility. Sustainability is one of the critical aspects of Industry 5.0, which has contributed to hyper-individualization and helps to create customized products with specific user needs. The concept of Industry 5.0, therefore, provides a focus and perspective and emphasizes the importance of research and innovation to support the industry in its long-term service to humanity within planetary boundaries (Breque, M., 2021). Before the official introduction of Industry 5.0, there were discussions about the "Age of Augmentation", where humans and machines are reconciled and work in symbiosis (Longo, F., 2020). In 2020, Kopacek, P. (2020). viewed Industry 5.0 as a lifeline for manufacturing. Recalling the benefits that Industry 4.0 brought to society, they believed that Industry 5.0 could bring about a paradigm shift in the way industry develops. Nahavandi (2019) argued that the urgent need to increase productivity without eliminating people from production poses serious challenges to the global economy. To address these challenges, they introduced the concept of Industry 5.0, which views the human-machine relationship as cooperative rather than competitive.

The previous discussion of Industry 5.0 did not focus on organizational issues arising from human-computer collaboration; at the same time, they discussed possible issues related to human-computer collaboration from the perspective of the organization and employees. Their research will undoubtedly be the focus of many future studies. Figure 1 shows a comparison of the concepts of the fourth and fifth industrial revolutions.

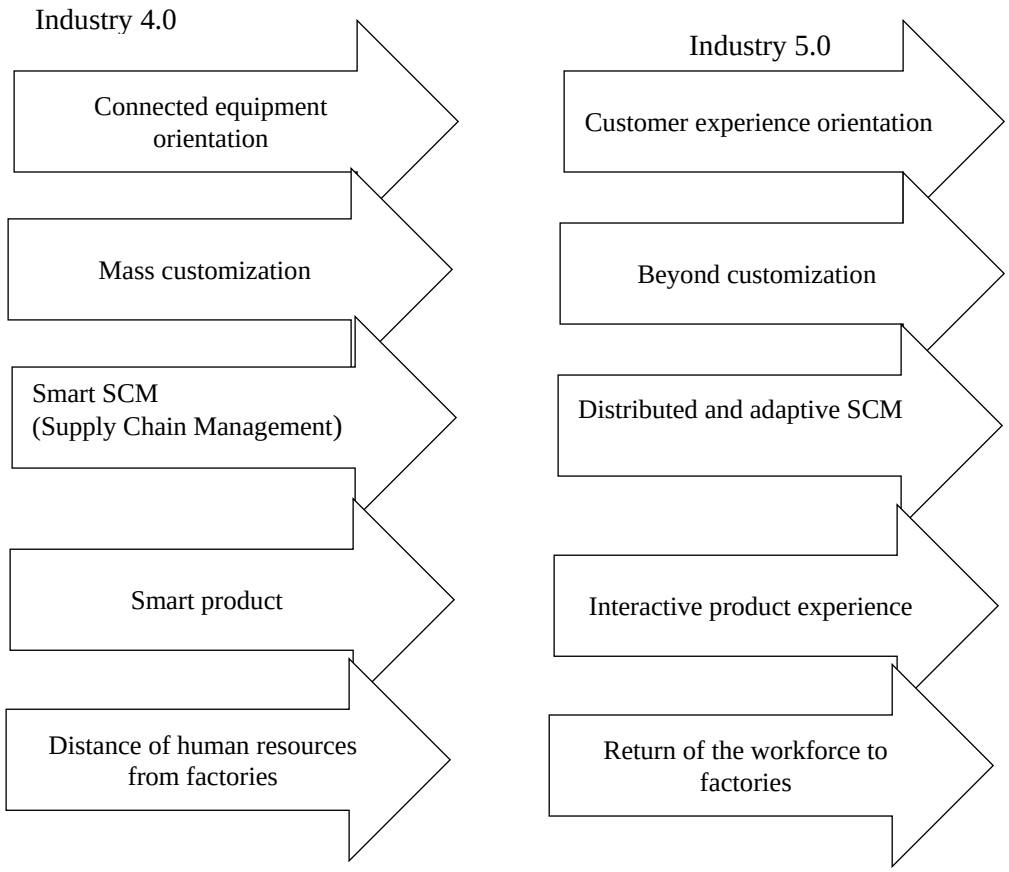

Fig. 1 – Comparison of the concepts of Industry 4.0 and 5.0
Source: compiled by the authors based on [1, 2, 13]

One of the key characteristics of Industry 4.0 is the transition from mass production to mass customization - the ability of businesses to produce individualized products with the efficiency of mass production. This approach is based on the synergy between high-tech tools (AI, robotics, 3D printing, digital twins) and human creativity, which allows for the creation of personalized value for customers. Within Industry 5.0, customization is moving to a qualitatively new level - from personalization to co-creation, when the consumer becomes not just an end user but a co-author of a product or service. This phenomenon goes beyond traditional customization, transforming the classic producer-consumer logic into a more interactive partnership model. Industry 5.0 is also transforming the classic supply chain management models, favoring distributed and adaptive SCM systems that can function effectively in the unstable, complex and digitalized global marketplace. Distributed SCM involves the decentralization of procurement, production, logistics, and storage processes, which reduces dependence on individual system nodes, increases flexibility, and reduces the risk of disruptions. This model is particularly effective in the face of geopolitical challenges or disruptions to global supply chains.

Industry 5.0 is an attempt to revive the presence of human labor in factories, where humans and machines will work together to improve process efficiency by fully utilizing human intelligence and creativity through their integration with today's intelligent systems.

Industry 4.0 ushered in an era of smart products that, thanks to sensors, Internet of Things (IoT) connectivity, and data analytics, were able to interact with the user, automatically adapt functions, and send data back to the manufacturer. However, the focus remained on the product itself as an object, and interaction with humans was instrumental. Industry 5.0 expands on this approach by shifting the focus from functionality to an interactive user experience in which technology works in tandem with human emotions, needs, and values. This means a shift from automated functions to empathetic interfaces; from reactive interaction to proactive collaboration between a person and a product; from intelligence within a product to an intelligent environment around the user. Thus, the transition from Industry 4.0 to Industry 5.0 reflects a profound transformation of the enterprise development paradigm - from technological automation to human-centered synergy between humans and machines.

The global Industry 5.0 market size was valued at USD 66,908,444.3 million in 2024 and is projected to reach USD 312,239,694.0 million by 2030, growing at a CAGR of 29.7% from 2025 to 2030. In Industry 5.0, the concept of human-robot collaboration, or "cobotics," is central [18].

The Industry 5.0 market demonstrates different levels of development depending on the economic potential of the regions, the level of digitalization, innovation capacity, and economic sustainability (Table 1).

Table 1. Levels of development of economic potential of regions and economic sustainability in Industry 5

Country/region	Implementation features	Impact on economic sustainability
South Korea	Leader in robot density (>1,012 robots per 10,000 employees); smart grids	Significant reduction in labor and energy costs; increased production stability
Japan	Society 5. 0" - a model of a super-smart society; cobots (collaborative robots) + IIoT (Industrial Internet of Things) in production	Increased production flexibility; adaptation to demographic changes; increased profitability
Germany/EU	EU emphasis on sustainability and human-centeredness; growth of AI among manufacturers (6 → 13 % in 2020-2023 in Germany)	Striving for eco-friendly production; improving the quality image and attracting investors
Asia Pacific Highest	CAGR (Compound Annual Growth Rate) (over 30%) due to large-scale automation, especially in China and Korea	Rapid increase in production capacity; boosting competitiveness and GDP
USA	Investments in AI, digital twins, smart factories (~30% share)	Optimization of production chains; EBITDA growth; support for business resilience

Source: compiled by the authors based on [18,19,20]

The Industry 5.0 market in North America gained the highest revenue share, accounting for approximately 30.0% in 2024. The region is a global leader in the implementation of Industry 5.0, thanks to innovative advances in artificial intelligence (AI), robotics, and digital dual technologies. Rapid automation in key sectors, including manufacturing and logistics, is increasing operational efficiency, productivity and sustainability. Supportive government policies and increased investment in smart factories are further accelerating the shift to automation and human-centered innovation. The U.S. Industry 5.0 market was dominant in 2024, driven by significant investments in AI-based robotics, edge computing, and smart manufacturing technologies. U.S. companies are increasingly adopting digital twins and augmented reality (AR) to optimize production processes, improve predictive maintenance, and reduce downtime. The resurgence of reshoring initiatives, combined with government incentives for the development of smart factories, is driving significant growth in industrial automation and technological innovation.

In 2024, the Europe Industry 5.0 market has been identified as a lucrative region characterized by a strong emphasis on sustainability, workforce collaboration, and smart manufacturing. The European Union's strategic policies promote AI-driven automation, circular economy practices, and digital transformation in industries such as automotive and aerospace. Significant investments in industrial IoT (IIoT) and cyber-physical systems are driving further market growth, positioning Europe as a key player in the global Industry 5.0 landscape.

Germany, a prominent leader in industrial automation, is advancing its Industry 5.0 initiatives with a focus on AI-driven smart manufacturing and digital dual technologies. Building on the solid foundation of Industry 4.0, Germany is leveraging its engineering expertise to implement intelligent automation solutions. Increased research and development in cyber-physical systems and IIoT is driving the next phase of manufacturing development, strengthening Germany's position as a key innovator in the Industry 5.0 market.

The Industry 5.0 market in Asia Pacific is expected to grow at the highest CAGR of over 31% from 2025 to 2030. Asia Pacific is witnessing a significant rise in Industry 5.0 adoption, led by technological advancements in robotics, artificial intelligence, and cloud computing. Manufacturing facilities in the region are investing heavily in smart factories, autonomous systems, and real-time data analytics. Growing demand for industrial automation in the automotive, electronics, and medical sectors is driving the market. China is at the forefront of Industry 5.0 adoption with aggressive investments in robotics, artificial intelligence, and smart manufacturing technologies. The government's “Made in China 2025” initiative is accelerating large-scale automation, reducing reliance on manual labor, and improving supply chain efficiency. The integration of predictive maintenance based on artificial intelligence and digital dual solutions is further optimizing industrial productivity and positioning China as a global leader in advanced manufacturing.

Japan continues to lead the way in AI-based robotics and automation, with Industry 5.0 initiatives focusing on human-machine collaboration.

The country's advanced robotics ecosystem and expertise in cyber-physical systems are shaping the future of smart manufacturing. Investments in 6G, edge computing, and IoT-based industrial solutions are increasing operational efficiency and scalability across industries, strengthening Japan's role as a key innovator in the Industry 5.0 market. [18].

Sustainable development, which has long been considered the pivot for modern enterprises, pushes industry towards environmental balance, socio-economic achievements, and ethical management. The combination of the Industry 5.0 vision and sustainability imperatives generates innovative solutions that meet the triple bottom line: people, planet, and profit. The lack of in-depth exploration of the synergies between Industry 5.0 and sustainability is a missed opportunity. The current knowledge gap limits our understanding of Industry 5.0's potential to catalyze transformational change that aligns industrial processes with sustainability criteria. Without a comprehensive examination of this link, the opportunity to use Industry 5.0 to promote environmental preservation, economic sustainability, and social well-being may be overlooked.

This oversight hinders theoretical advancement and prevents the identification of practical innovative solutions to sustainability challenges. Sustainability in Industry 5.0 covers a variety of areas, from resource management and waste reduction to the promotion of fair labor conditions.

With Industry 5.0 sustainability goals, businesses can use dynamic modeling, CAI (Collaborative Artificial Intelligence), and big data to develop a digital replica of supply chain operations and identify bottlenecks, weak links, risks, and inevitable disruptions to improve the adaptability and responsiveness of supply chains.

The relationship between the areas of Industry 5.0 and the factors that may affect the sustainability of enterprises is presented in Table 2.

Table 2. The impact of Industry 5 on enterprise sustainability.

Areas of Industry 5.0	Factors influencing the sustainability of enterprises
Human-centered approach	- improving staff motivation and productivity (involves individualizing work, developing employees' creative potential, and using technology to support rather than replace human capital) - reducing staff turnover costs (companies that follow human-centered approaches create a more favorable working environment, which has a positive impact on staff satisfaction. This reduces the level of dismissals and reduces the cost of recruiting, adapting and training new employees) - building a socially responsible image (in the context of growing attention to ESG factors (environmental, social, and governance aspects), companies with a clearly defined human-centered policy gain competitive advantages in the market. Social responsibility improves investor relations, increases customer loyalty, and opens up access to financing from sustainable development funds. This reduces the cost of capital and increases long-term financial stability).
Sustainability (environmental and resource)	- reduction of resource and energy costs (implementation of resource-saving technologies and innovative approaches to energy management helps to reduce overall production costs) - optimization of production processes - avoidance of environmental fines and reputational risks (adherence to the principles of environmental responsibility reduces the likelihood of fines for violations of environmental legislation and reduces the risks associated with reputational losses. This approach contributes to the formation of a positive image of the company as an environmentally oriented business entity, which is an additional asset in interaction with investors, partners and consumers)
Intelligent automation and human-machine collaboration	- increase in production efficiency (joint work of man and machine allows for optimal distribution of functions: automated systems perform routine and resource-intensive processes, while operators focus on analytical, creative or managerial tasks) - reduction of production costs - optimization of financial flows through more accurate planning (due to accurate forecasting of resource requirements and optimization of logistics processes, enterprises are able to improve budgeting, cost planning and investment, which strengthens their financial stability in the long term)
Technological inclusiveness and flexibility	- rapid market adaptability - diversification of income sources - enhancement of investment attractiveness
Digital Security and Cyber Resilience	- protection of financial data and assets - minimization of cyberattack risks that may lead to financial losses - increased trust from partners and clients
Innovative ecosystem and open innovation	- access to new sources of financing (grants, investors) - increased competitiveness - expansion of sales markets through innovative products and services

Source: compiled by the authors based on [1, 2, 3, 4]

The implementation of Industry 5.0 technologies significantly transforms the financial structure of enterprises, contributing to the strengthening of their resilience. Firstly, through the adoption of automated control systems, energy-efficient technologies, and intelligent production processes, there is a substantial reduction in operating expenditures (OPEX).

This lowers the financial burden on the enterprise and creates additional opportunities for investment in development.

Secondly, the integration of innovative digital solutions—such as artificial intelligence, digital twins, and predictive analytics systems—enhances the return on investment (ROI) and increases profitability as measured by Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA). This reflects not only improved operational efficiency but also the overall market competitiveness of the enterprise.

In addition, Industry 5.0 contributes to the improvement of enterprise liquidity, particularly through the implementation of smart inventory management systems that enable optimization of current assets and reduction of storage costs. Predictive modeling tools allow for more efficient cash flow planning, minimizing solvency risks. Thus, Industry 5.0 not only drives the innovative development of enterprises but also strengthens their financial stability in both the short and long term.

Discussion. This section presents a detailed analysis of the research findings, focusing on key conclusions and their significance in the context of current Industry 5.0 challenges for enterprises in the digital space. A visual representation of the various outcomes and potential benefits that Industry 5.0 can offer businesses in terms of sustainable development efficiency is provided. By presenting the results in this manner, the study aims to deliver a clear and structured understanding of the multifaceted impact of Industry 5.0 on companies' sustainability practices at different levels of analysis, including economic, environmental, and social resilience (Figure 2).

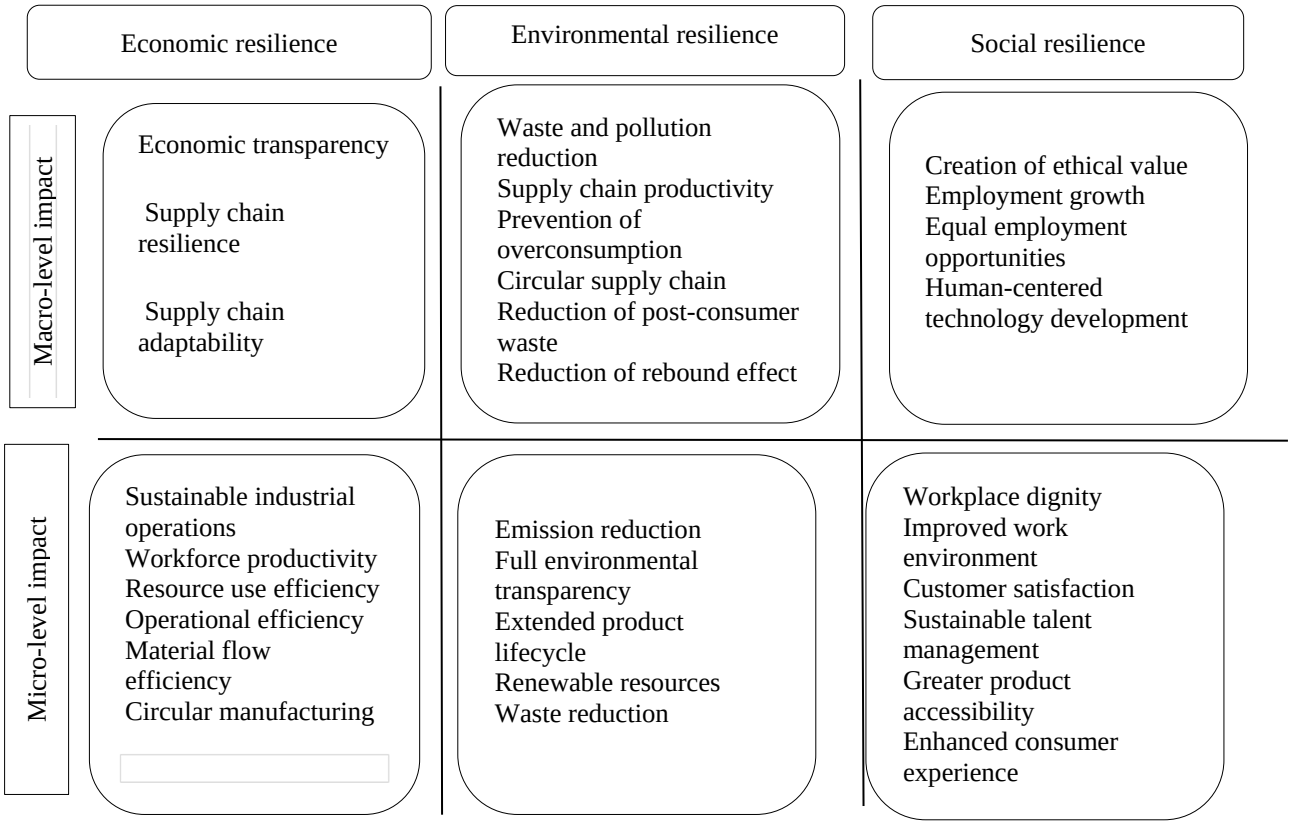

Fig. 2 – Components of sustainability in Industry 5.0
Source: compiled by the authors based on [9,12,14,16]

Figure 2 presents a well-balanced perspective on the contribution of the three core elements of sustainable development to Industry 5.0 at both the micro- and macro-levels of analysis. It highlights the substantial alignment between the microeconomic objectives of Industry 5.0 and those of Industry 4.0. Scholars suggest that within the context of Industry 5.0, the promotion of prosperity and growth remains closely tied to the financial success and economic efficiency of

corporations. Achieving this necessitates the deployment of advanced technologies to enhance logistics and material flow management, optimize operations, and improve workforce productivity.

This approach lays the groundwork for corporations to accumulate the necessary resources and financial stability, which in turn enables them to prioritize the enhancement of social and environmental values. Furthermore, Industry 5.0 technologies are believed to strengthen internal operational resilience, equipping enterprises and corporations with the adaptive capacity to withstand current and future disruptions—thereby securing their long-term survival and competitive advantage.

The real-time data analysis enabled by Industry 5.0 facilitates the continuous optimization of production processes, leading to streamlined operations and improved efficiency. The emphasis of Industry 5.0 on human-machine collaboration supports dynamic decision-making, where AI-powered algorithms and predictive models assist human experts in making informed choices amid rapidly changing conditions.

In terms of environmental sustainability, Industry 5.0 offers a multifaceted pathway for reducing waste within corporations through its transformative technologies and principles. By integrating interconnected cyber-physical systems, advanced sensors, and real-time data analytics, Industry 5.0 enables precise monitoring and analysis of production processes. It further enhances corporate environmental resilience by optimizing resource efficiency across business operations while simultaneously reducing emissions.

Industry 5.0 achieves these outcomes through a suite of transformative technologies. The concept of digital twins—virtual replicas of physical assets—facilitates the simulation and analysis of multiple operational scenarios, allowing companies to identify resource-efficient strategies that mitigate emissions prior to implementation. This proactive approach supports data-driven environmental decision-making and fosters the transition to more sustainable industrial practices.

Despite receiving relatively less recognition, Industry 5.0 is increasingly perceived as a catalyst that enables corporations to enhance end-to-end environmental transparency and extend the lifecycle of their products. This dimension of Industry 5.0 entails a comprehensive understanding of the entire product life cycle—from raw material extraction to disposal or recycling.

By leveraging technologies such as the Internet of Everything (IoE), data analytics, and digital twins, corporations can gain unprecedented insights into every stage of a product's journey. This transparency facilitates improved tracking of resource usage, waste generation, and environmental impact, enabling more informed decision-making aimed at minimizing ecological footprints.

Taking a broader view of the supply chain process, Industry 5.0 introduces substantial innovations to address critical environmental challenges at scale. Two of its key contributions include reducing industrial waste and pollution, and promoting circularity in supply chains. Industry 5.0 offers a multifaceted framework that empowers enterprises to tackle issues of overconsumption, post-consumer waste, and the rebound effect.

Through real-time data-driven analysis and the integration of the Internet of Things (IoT), Industry 5.0 enhances demand forecasting accuracy, allowing companies to better align production levels with actual consumer needs, thereby minimizing excess output and resource waste.

When analyzing the potential social benefits that Industry 5.0 may offer—particularly at the corporate level—these advantages are primarily associated with the enhancement of working conditions for employees. This involves the creation of a smarter, safer, more dignified, and fulfilling work environment. In Industry 5.0, technologies are deliberately adapted to meet the evolving needs of the workforce.

This human-centric shift reinforces a sense of dignity among workers, as their intrinsic value is acknowledged within an ecosystem that respects their expertise and preferences. Such transformation fosters a sense of empowerment and self-respect, thereby increasing overall job satisfaction and employee well-being.

The technological solutions underpinning Industry 5.0—including adaptive robotics, smart wearable devices, and cognitive information systems—are instrumental in reshaping the workplace. They promote a transition toward human-machine collaboration that supports inclusive and responsive interaction, aligning technological advancement with human values and capabilities.

These technologies enable the efficient delegation of routine, physically demanding, or hazardous tasks to automated systems, thereby allowing workers to focus on assignments that require a high level of cognitive engagement and creative input. Moreover, such tools facilitate continuous access to mission-critical, real-time data, enhancing both the quality and responsiveness of decision-making processes.

As a result, employees are granted broader authority in managing production operations, which reduces dependency on centralized oversight and fosters the emergence of decentralized management models within enterprises. Additionally, Industry 5.0 can significantly improve workplace safety by integrating a multifaceted approach that includes cognitive computing, predictive analytics, real-time monitoring, and intelligent sensors.

In terms of sustainable talent management, Industry 5.0's data-driven capabilities can be harnessed to effectively identify and engage skilled individuals aligned with sustainability goals and social value creation. By leveraging diverse data sources, enterprises are better positioned to recruit candidates whose values resonate with the objectives of corporate social responsibility (CSR).

The conducted research confirms the importance of the technological components of Industry 5.0, which can contribute to economic, environmental, and social sustainability at both the firm and industry levels. The findings emphasize that Industry 5.0 remains an emerging concept in academic discourse, which explains the currently limited exploration of its impact on corporate sustainability performance. The study also highlights the necessity for further research in this area—particularly given the acceleration of digital transformation processes and the increasing economic uncertainties affecting enterprises worldwide.

Although the vision and principles of Industry 5.0 present a promising paradigm shift, the study reveals that the development and maturation of this concept are progressing significantly slower than the rapid proliferation of disruptive technologies and broader market transformations. This observation helps explain why Industry 5.0 largely remains at a conceptual and aspirational stage, where the ambition for achieving sustainable outcomes exists, but practical implementation and measurable progress remain limited.

Although there is currently no concrete evidence demonstrating the practical advantages of Industry 5.0 for the economy, society, and the environment, it is reasonable to assert that Industry 5.0 is being established as a vital normative framework. Major economies such as the United States, Japan, and various European countries have made significant progress in regulating the development, marketing, and widespread application of technologies, particularly artificial intelligence. Industry 5.0 represents a promising pathway for supporting this regulatory momentum.

A critical aspect lies in the commitment of stakeholders to advancing the Industry 5.0 agenda. Their concerted efforts must be accelerated to refine the framework and transition it from a conceptual vision to practical implementation in real-world settings.

Future research must undertake a comprehensive examination to closely monitor the progress of Industry 5.0 adoption across various sectors. Such research initiatives should evaluate its impact on corporate profitability and long-term sustainability. This can be achieved through detailed analysis of enterprise-level data from firms that have begun adopting Industry 5.0 methodologies, enabling a comparative assessment of their financial and sustainability performance before and after the integration of these innovative practices.

It is crucial to emphasize that these case studies should go beyond merely documenting technological integration.

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The article was received by the editors 02.04.2025
The article is recommended for printing 19.05.2025

Authors Contribution: *All authors have contributed equally to this work*
Conflict of Interest: *The authors declare no conflict of interest*

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Вплив Індустрії 5.0 на стійкість підприємств у цифровому середовищі

Анотація. У статті досліджується вплив Індустрії 5.0 на стійкість підприємств у цифровому середовищі, що обумовлює високу актуальність теми у контексті глобальної цифрової трансформації та викликів сталого розвитку. У центрі уваги – нова парадигма, що виходить за межі автоматизації Індустрії 4.0, акцентуючи на людському факторі, соціальній відповідальності та етичній цінності в управлінні підприємствами.

Метою дослідження є комплексний аналіз потенціалу Індустрії 5.0 як чинника зміцнення фінансової, соціальної та екологічної стійкості підприємств. Об'єктом виступають підприємства, що перебувають на різних етапах цифрової зрілості та впровадження інноваційних практик. Методологічною основою є поєднання системного, порівняльного та структурно-функціонального аналізу. Додатково використано аналіз вторинних даних, ринкової аналітики, а також міжнародних кейсів країн-лідерів.

Результати свідчать, що, попри активне зростання глобального ринку Industry 5.0 (прогнозований CAGR 29,7% до 2030 року), впровадження цієї моделі на практиці відбувається повільно. Виявлено, що розумні системи управління запасами, масова кастомізація та інтелектуальні виробничі процеси позитивно впливають на фінансову стабільність підприємств. Водночас, відсутність достатньої емпіричної бази вимагає подальших досліджень із залученням підприємств-респондентів для оцінки динаміки змін.

Практична цінність роботи полягає у формуванні методологічних засад для розробки політик цифрової трансформації, побудові моделей адаптивного управління та оцінки корпоративної стійкості у цифрову епоху. Зроблено висновок, що Індустрія 5.0 не лише продовження попередніх індустріальних етапів, а якісно нова концепція, орієнтована на людину та сталий розвиток.

Ключові слова: Індустрія 5.0, стійкість, людиноорієнтовані технології, підприємство, сталий розвиток, цифрова трансформація.

Формули: 0; рис.: 2; табл.: 2; бібл.: 20.

Для цитування: Gorobynskaya M., Krivtsova T. The Impact of Industry 5.0 on Enterprise Resilience in the Digital Environment. Фінансово-кредитні системи: перспективи розвитку. №2(17) 2025. С. 167-179. DOI: https://doi.org/10.26565/2786-4995-2025-2-14

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Стаття надійшла до редакції 02.04.2025
Статтю рекомендовано до друку 19.05.2025

Внесок авторів: *всі автори зробили рівний внесок у цю роботу*
Конфлікт інтересів: *автори повідомляють про відсутність конфлікту інтересів*