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Implementation of Artificial Intelligence in EU Industry: Trends analysis

The article analyzes current trends in the implementation of artificial intelligence (AI) technologies in manufacturing in the European Union. It is established that since 2018, the EU has evolved from the formation of basic regulatory frameworks to a comprehensive architecture aimed at integrating AI into economic systems, production processes, and organizational models.

It was found that the share of enterprises using at least one AI technology increased from 6.93% in 2021 to 17.27% in 2025, indicating a shift from fragmented use to systematic integration of AI in production and management processes. The analysis of high-tech (KTI) and traditional (non-KTI) sectors revealed clear structural differences: in 2025, the highest levels of AI adoption among KTI sectors were recorded in pharmaceutical manufacturing (41.32%), computer, electronic, and optical equipment production (37.44%), chemical manufacturing (28.45%), electrical equipment manufacturing (25.90%), and mechanical engineering (25.45%). This reflects the high intensity of digitalization in knowledge-intensive sectors, where AI is integrated into production and innovation processes.

It was determined that national AI adoption trajectories in 2021–2025 form two groups: 1) countries with a high initial base (over 10%), including Denmark, Luxembourg, the Netherlands, Germany, Slovenia, Austria, Belgium, and Sweden, demonstrate stable digital transformation; 2) countries with a lower starting base, such as Estonia, Lithuania, Ireland, and Malta, show accelerated growth. For Ukraine, research priorities are justified: assessing the efficiency of digital transformation under limited resources, integrating ICT and AI into traditional manufacturing and service sectors, and identifying factors that stimulate digital innovation.

The results may serve as a scientific basis for improving strategic documents on the digitalization of Ukraine's economy, promoting high-tech sectors, supporting traditional sectors through AI access, standardizing solutions and personnel training, and considering European regulatory approaches to integrate Ukrainian manufacturing into the EU digital space.

Key words: *artificial intelligence (AI), digitalization, high-tech sectors, public policy, innovation, manufacturing, digital transformation.*

Problem Statement. The rapid development of artificial intelligence (AI) technologies is causing profound transformations in economic systems, production processes, and organizational models. In industry, AI is becoming a key factor in increasing efficiency by enabling the automation of production, the processing of large volumes of data, and the support of managerial decision-making. The use of AI technologies creates new sources of competitive advantage in industrial sectors, where the optimization of production, logistics, and control processes, quality management, and decision-making support at all levels of the organization directly affect productivity.

In recent years, the EU has been building a comprehensive regulatory and strategic environment for the development of AI, which is intended to serve as a geopolitical response to the dominance of the United States and China in the digital sphere. While the American model is based on the expansion of private technology giants and the Chinese model on centralized state governance, the European strategy emphasizes the autonomy and security of critical industrial sectors. The integration of AI into the industrial core, particularly in Germany, is aimed at enhancing technological sovereignty and protecting the intellectual capital of European manufacturers, ensuring the autonomy of key industrial sectors and strengthening competitive positions in global markets.

Despite a thorough study of policy instruments and the regulatory framework for AI, researchers often overlook the quantitative assessment of the concentration level of enterprises implementing AI technologies in industry. This applies to both the pan-European level and the specifics of individual sectors in EU member states. Conducting such an economic and statistical analysis will allow not only for recording the current state of AI use but also for identifying trends formed under the influence of regulatory policy and dynamic market conditions.

Analysis of current research. Analysis of scientific literature indicates that AI technologies are considered a key driver of digital transformation within the Industry 4.0 concept [1–3]. AI is presented as a tool for increasing productivity, product quality, cost efficiency, and improving decision-making skills.

At the same time, significant attention is paid to the barriers to AI implementation [4; 5]. Key limitations include ethical and legal aspects, issues of data protection and privacy, insufficient levels of personnel training, as well as technical and organizational difficulties, particularly integration with existing systems, scalability, and the reliability of technological solutions.

Methodologically, studies combine qualitative and quantitative approaches. On one hand, systematic reviews, bibliometric, and content analyses are used, aimed at generalizing the scientific discourse [6]. On the other hand, empirical research utilizes surveys and econometric methods, particularly the partial least squares structural equation modeling (PLS-SEM), to assess the impact of AI on organizational outcomes, productivity, and personnel development [7]. Thematic reviews and case studies complement these approaches with an analysis of the practical aspects of AI integration into production systems [8; 9].

Thus, modern scientific literature points to the significant role of AI as a driver of the digital transformation of industry and emphasizes the need for a comprehensive approach to its implementation, combining technological, organizational, managerial, and personnel components. At the same time, a limited number of studies are devoted to the quantitative assessment of the level of AI integration in a sectoral context and the analysis of digitalization dynamics considering the technological level of production.

In this context, the purpose of the article is to assess the trends of AI integration in the EU manufacturing industry in 2021–2025, analyze the concentration of enterprises using AI by types of economic activity taking into account the technological level of industries, and compare national trajectories of AI usage.

Sources and methods. The study relies on official international statistical data and analytical materials, ensuring the comparability and reliability of the results. The primary sources are Eurostat databases, specifically indicators of AI adoption by enterprises, as well as World Bank data, which complement the analysis with the macroeconomic context of digital transformation. Additionally, scientific publications and analytical reports have been used to form the theoretical basis of the research.

The methodology combines economic-statistical and comparative approaches. Economic-statistical methods allow for estimating the share of enterprises using AI in various sectors of the EU manufacturing industry (2021–2025), determining growth rates and changes, as well as constructing time series to identify digitalization trends. The comparative approach ensures the juxtaposition of AI integration levels between industries and countries, the analysis of structural differences between high-tech and traditional sectors, and the assessment of AI implementation effectiveness in functional areas of enterprise activity, such as production, logistics, marketing, research and development, cybersecurity, and finance. This combination of methods enables a comprehensive analysis of industrial digitalization, where statistical data form the quantitative basis, and comparative analysis reveals inter-industry and cross-country patterns of AI integration.

Presentation of the main research material. Since 2018, the European Union has consistently formed a regulatory and strategic environment for the implementation of AI technologies, starting with the "Artificial Intelligence for Europe" initiative [10], the creation of the High-Level Expert Group on AI [11], and the adoption of the "Coordinated Plan on Artificial Intelligence" [12], which laid the foundation for the European approach to developing trustworthy and ethical AI. These initiatives are aimed at forming regulatory frameworks, strengthening coordination between member states, and developing an ecosystem of industrial research and technological innovation in the industry.

In 2020, the EU published the "White Paper on Artificial Intelligence" [13], which defined the principles for the ethical and risk-oriented development of AI, and also initiated the scaling of data infrastructure through the European Data Strategy [14] and the Data Governance Act [15], which contributed to the formation of European data spaces for training industrial AI models. In 2021, the updated Coordinated Plan on Artificial Intelligence [16] strengthened coordination between member states and created the prerequisites for stimulating investment, scientific research, and the practical implementation of technologies in strategic sectors of the economy.

Key regulatory milestone was the adoption of the Artificial Intelligence Act [17] – the world's first comprehensive regulation implementing a risk-based approach to the assessment of AI systems. To ensure its practical implementation, the European AI Office was established [18], which coordinates the application of norms, develops technical standards, and codes of practice, transforming regulatory requirements into applied tools for developers and users.

In 2024–2025, the EU introduced a series of initiatives aimed at accelerating AI implementation and stimulating innovation, including the AI Innovation Package [19], the GenAI4EU initiative [20], as well as the Continental AI Action Plan [21] and the AI Application Strategy [22], which are focused on developing competencies, expanding access to computing resources, and integrating AI into key economic sectors, including industry.

Thus, the regulatory and institutional environment formed in the EU creates conditions not only for the safe and ethical use of AI but also for accelerating technological development and strengthening industrial competitiveness. At the same time, to assess the effectiveness of these measures, it is necessary to move from policy description to its empirical measurement. In this context, monitoring innovation and investment development and the digitalization of business structures plays an important role. As noted in the work of one of the authors [23], such monitoring is a key tool for ensuring the strategic resilience and competitiveness of enterprises. In particular, it allows for the systematic control of the implementation of digital technologies and innovations, timely identification of risks and threats, assessment of the effectiveness of investments in digital solutions, and the formation of evidence-based management strategies that contribute to increasing the productivity and technological maturity of organizations.

Against this background, the assessment of the effectiveness of policy initiatives in the field of AI is carried out based on a systematic quantitative analysis of the level and nature of technology implementation at enterprises. To ensure such an analysis, a specialized monitoring toolkit has been formed in the EU. In particular, Eurostat has introduced an annual survey based on a dedicated questionnaire, which is implemented by the national statistical authorities of the member states. Starting from 2020, in cooperation with the OECD, the survey was gradually supplemented with questions regarding AI usage, which became part of the harmonization of statistical tools for tracking the dissemination of advanced digital technologies. After the pilot testing phase of relevant questions, since 2023, they have been fully integrated into the standard questionnaire, enabling the systematic measurement of AI implementation at the enterprise level. The methodology for data collection and processing is standardized at the EU level. Eurostat provides detailed recommendations in the European Business Statistics Handbook on ICT usage in enterprises, which regulate the procedures for the compilation, validation, and dissemination of statistics on AI usage. The data processing process covers four main stages: the formation of national data; its submission to Eurostat; quality assessment and validation; and publication in open access. Such an organization ensures the comparability of statistical indicators between countries and overtime, creating a basis for evaluating the effectiveness of the implementation of the EU's strategic and regulatory initiatives [24].

At the same time, given the structural heterogeneity of the industry, this study proposes to deepen the methodology for analyzing AI implementation by considering the technological level of sectors. Such an approach allows for a more accurate identification of knowledge-intensive segments, the revelation of inter-sectoral disparities, and an increase in the analytical validity of digital transformation assessments.

To analyze the use of AI in industry, classifications and aggregations of sectors by technological level were applied. According to the Eurostat NACE Rev. 2 classification, high-technology and medium-high-technology sectors include: chemicals and chemical products (C20); basic pharmaceutical products and pharmaceutical preparations (C21); weapons and ammunition (C25.4); computer, electronic and optical products (C26); electrical equipment (C27); machinery and equipment not elsewhere classified (C28); motor vehicles, trailers and semi-trailers (C29); other transport equipment (C30, excluding C30.1); medical and dental instruments and supplies (C32.5). To ensure data comparability, three-digit codes are aggregated into two-digit ones. At the same time, certain sub-sectors have a different technological level, which requires adjustments to the classification to avoid statistical distortions: thus, C25.4 belongs to medium-low-technology sectors, while C32.5 belongs to low-technology sectors [25]. As a result, at the two-digit level, the corresponding group includes C20, C21, C26–C30.

According to the OECD approach, industrial sectors are classified by the level of technological intensity. In alignment with this approach, the U.S. National Science Foundation (NSF) combines high-technology and medium-high-technology manufacturing into a category of knowledge- and technology-intensive industries (KTI industries) [26].

Given the aforementioned classifications and aggregations, the industrial sectors in this study are divided into KTI industries (sectors under codes C20, C21, C26–C30 NACE Rev. 2) and non-KTI industries (other manufacturing sectors). Hereafter, the abbreviations KTI and non-KTI are used in the text. The use of such aggregation generalizes the analysis results while ensuring their analytical relevance, focusing attention on technologically complex and knowledge-intensive industrial segments where AI implementation is most intensive and economically significant.

Based on the Eurostat database [27], the share of EU enterprises (with 10 or more employees) that apply at least one of the key artificial intelligence technologies has been assessed. According to Eurostat methodology, such technologies include: machine learning, including deep learning; natural language processing; image and video recognition systems; text data analysis; decision support and forecasting systems; robotic process automation; autonomous robots and transport systems; and integrated AI-based solutions for optimizing production and business processes.

As shown by the data in Figure 1 (constructed by the authors based on [27]), the share of enterprises in the manufacturing industry using at least one AI technology increased from 6.93% in 2021 to 17.27% in 2025 (+10.34 p.p.), reflecting a transition from fragmented implementation to more systematic integration of AI into production and management processes.

An analysis across KTI and non-KTI sectors (Table 1, constructed by the authors based on [27]) reveals distinct structural differences in the pace and scale of digitalization. In 2025, the highest levels of AI utilization among KTI industries were recorded in pharmaceutical manufacturing (C21) at 41.32% (+25.59 p.p. compared to 2021), the manufacture of computer, electronic, and optical products (C26) at 37.44% (+20.61 p.p.), the chemical industry (C20) at 28.45% (+18.68 p.p.), the manufacture of electrical equipment (C27) at 25.90% (+15.51 p.p.), and machinery and equipment manufacturing (C28) at 25.45% (+13.60 p.p.). This indicates a high intensity of AI implementation in knowledge-intensive sectors, where digital technologies are directly integrated into production and innovation processes.

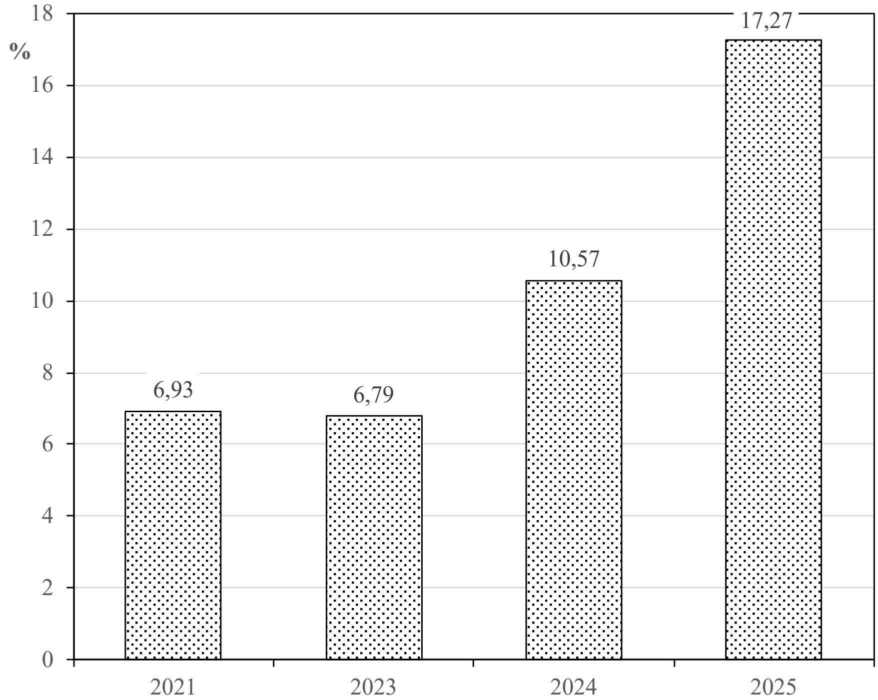

Figure 1. Dynamics of AI implementation in the EU manufacturing industry

As shown by the data in Fig. 1 (constructed by the authors based on [27]), the level of AI utilization in non-KTI industries remains lower (mostly within the range of 12–17%), however, certain sub-sectors demonstrate relatively high values. In particular, in the manufacture of coke and refined petroleum products (C19), this indicator reached 30.41%, which is associated with high capital intensity and the need for digitalization of continuous production processes. Other industries, such as the wood and paper industries (C16–C18), where the analyzed indicator is 15.63%, and furniture manufacturing (C31–C33), at 17.16% respectively, are characterized by slower rates of AI implementation, due to lower technological complexity and limited investment opportunities.

Analysis of the dynamics in 2021–2025 demonstrates the uneven distribution of AI across industry groups. In KTI industries, the increase ranges from 12.5–25.6 p.p., while in non-KTI sectors it is 7.4–9.3 p.p., leading to a widening inter-industry gap. While in 2021 the share of enterprises using AI in KTI industries ranged within 9.8–16.8% and in non-KTI within 3.7–7.9%, by 2025 these intervals shifted to 23.9–41.3% and 12.0–17.2%, respectively.

As already noted, in 2025, 17.3% of enterprises in the EU manufacturing industry applied at least one AI technology. As shown by the data in Figure 2 (constructed by the authors based on [27]), against this background, a group of leading countries stands out, including Belgium (39.8%), Denmark (38.6%), Luxembourg (37.6%), Sweden (32.9%), Austria (32.5%), the Netherlands (28.6%), Norway (26.0%), Germany (24.4%), Slovenia (22.7%), Estonia (22.7%), Lithuania (19.2%), Ireland (17.7%), and Malta (17.8%), which exceed the European average.

Table 1

Dynamics of AI implementation by EU manufacturing industries*

(%)

NACE Rev. 2	KTI / non-KTI	2021	2023	2024	2025	Growth 2021–2025 (p. p.)
C10–C12	non-KTI	5.04	5.42	6.79	12.47	7.43
C13–C15	non-KTI	3.66	4.16	5.98	12.01	8.35
C16–C18	non-KTI	6.35	5.04	9.37	15.63	9.28
C19	non-KTI	17.81	13.92	20.35	30.41	12.60
C20	KTI	9.77	11.07	16.7	28.45	18.68
C21	KTI	15.73	17.32	25.82	41.32	25.59
C22–C23	non-KTI	7.91	7.68	11.98	16.77	8.86
C24–C25	non-KTI	5.94	5.68	8.59	14.33	8.39
C26	KTI	16.83	16.89	25.29	37.44	20.61
C27	KTI	10.39	10.64	16.37	25.9	15.50
C28	KTI	11.85	9.83	14.85	25.45	13.60
C29–C30	KTI	11.39	11.58	14.59	23.86	12.47
C31–C33	non-KTI	4.70	5.21	11.45	17.16	12.46

Note: C – Manufacturing; C10–C12 – Manufacture of food products, beverages and tobacco products; C13–C15 – Manufacture of textiles, wearing apparel, leather and related products; C16–C18 – Manufacture of wood and paper products, printing and reproduction services; C19 – Manufacture of coke and refined petroleum products; C20 – Manufacture of chemicals and chemical products; C21 – Manufacture of basic pharmaceutical products and pharmaceutical preparations; C22–C23 – Manufacture of rubber and plastic products and other non-metallic mineral products; C24–C25 – Manufacture of basic metals and fabricated metal products, except machinery and equipment; C26 – Manufacture of computer, electronic and optical products; C27 – Manufacture of electrical equipment; C28 – Manufacture of machinery and equipment not elsewhere classified; C29–C30 – Manufacture of motor vehicles, trailers, semi-trailers and other transport equipment; C31–C33 – Manufacture of furniture; jewelry, musical instruments, toys; repair and installation of machinery and equipment.

The analysis of national trajectories in 2021–2025 allows for the identification of two groups of countries based on the starting conditions for AI implementation. The first group includes states with a relatively high initial base (over 10%), in particular Denmark, Luxembourg, the Netherlands, Germany, Slovenia, Austria, Belgium, and Sweden. For these countries, maintaining high positions in 2025 is characteristic, with varying growth intensities, reflecting the sustainability of digital transformation and the presence of an established ecosystem for AI implementation.

The second group includes countries with a lower starting base but higher growth rates. For instance, between 2021 and 2025, the level of AI utilization rose in Estonia from 2.7% to 22.7%, in Lithuania from 5.1% to 19.2%, in Ireland from 8.8% to 17.7%, and in Malta from 6.2% to 17.8%. Such dynamics indicate an accelerated convergence effect, where a lower initial level does not act as a constraint but is instead accompanied by faster adoption of digital technologies.

Germany was selected for in-depth analysis due to a combination of factors. First, the country's economic scale: according to World Bank data [28], in 2024, the volume of its manufacturing industry amounted to $843.72 billion, or approximately 30.25% of the total EU industrial output. Second, the structural diversification of the country's industry – particularly the presence of developed mechanical engineering, automotive, chemical, and electronic sectors – allows for the analysis of AI implementation across diverse technological environments. Third, the level of digitalization: in 2025, the share of enterprises using AI stood at 24.4%, exceeding the EU average. The combination of these factors identifies Germany as a representative subject for analysis.

As shown by the data in Table 2 (constructed by the authors based on [27]), the dynamics of AI implementation in Germany's manufacturing industry indicate a transition from the stage of experimental use to a phase of large-scale technological diffusion. At the same time, a structured model of AI distribution is forming, characterized by a clear differentiation between KTI and non-KTI sectors, which is becoming increasingly pronounced over time.

In the KTI segment, steady leadership is maintained both in terms of AI penetration and its growth rate. The highest indicators were recorded in the manufacture of computer, electronic, and optical products (C26), where the share of enterprises reached 42.49% in 2025 (+24.38 p.p.). High dynamics are also characteristic of the pharmaceutical sector (C21), where growth from 16.84% to 38.25% reflects the critical role of AI in biomedical research. Mechanical engineering (C28) and transport manufacturing (C29–C30) reached levels exceeding 30%, which aligns with the transformation of traditional industry toward smart manufacturing.

At the same time, a catch-up development effect is observed in non-KTI industries. Despite lower initial levels, these sectors demonstrate the highest growth rates. In particular, in the wood, paper, and printing industries (C16–C18), the indicator rose by 18.52 p.p. to 27.38%, and in textile manufacturing (C13–C15) – from 6.8% to 22.6%. This indicates a reduction in barriers to AI implementation and the gradual standardization of

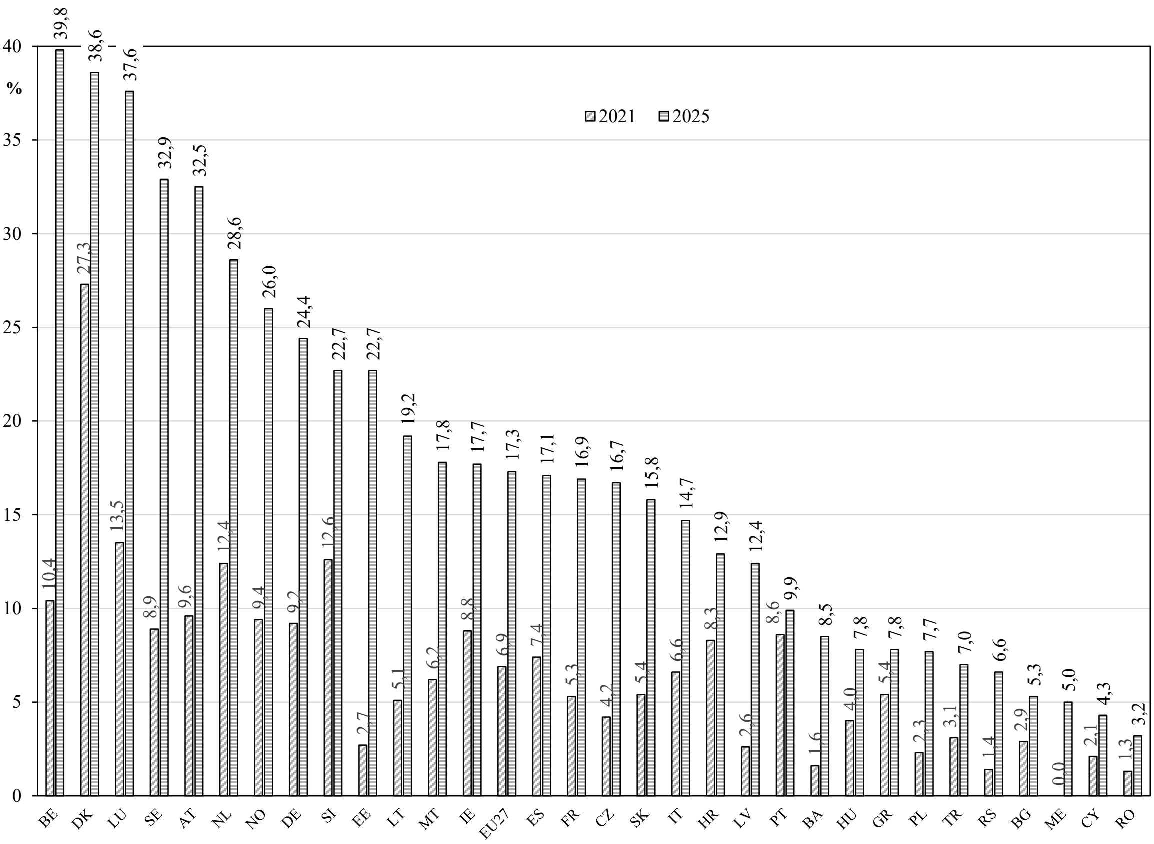

Figure 2. Dynamics of AI implementation in the manufacturing industry by EU countries*

Note: Belgium (BE), Denmark (DK), Luxembourg (LU), Sweden (SE), Austria (AT), Netherlands (NL), Norway (NO), Germany (DE), Slovenia (SI), Estonia (EE), Lithuania (LT), Malta (MT), Ireland (IE), EU27, Spain (ES), France (FR), Czechia (CZ), Slovakia (SK), Italy (IT), Croatia (HR), Latvia (LV), Portugal (PT), Bosnia and Herzegovina (BA), Hungary (HU), Greece (GR), Poland (PL), Türkiye (TR), Serbia (RS), Bulgaria (BG), Montenegro (ME), Cyprus (CY), Romania (RO).

Table 2

Dynamics of AI implementation by German manufacturing industries*

(%)

NACE Rev. 2	KTI / non-KTI	2021	2023	2024	2025	Growth, p. p.
C	–	9.19	9.32	16.11	24.38	15.19
C10–C12	non-KTI	5.26	6.89	9.25	15.1	9.84
C13–C15	non-KTI	6.8	7.61	15.67	22.6	15.8
C16–C18	non-KTI	8.86	6.05	15.8	27.38	18.52
C19	non-KTI	н/д	н/д	40.35	45.65	5.3
C20	KTI	13.94	15.45	23.02	34.14	20.2
C21	KTI	16.84	14.43	38.25	н/д	23.82
C22–C23	non-KTI	8.45	10.53	18.98	22.05	13.6
C24–C25	non-KTI	6.58	8.49	12.69	21.54	14.96
C26	KTI	18.11	19.65	28.73	42.49	24.38
C27	KTI	15.48	12.49	19.84	29.37	13.89
C28	KTI	15.65	10.91	20.13	31.28	15.63
C29–C30	KTI	17.7	16.18	20.85	30.92	13.22
C31–C33	non-KTI	6.05	6.48	15.68	22.94	16.89

Note: For C21, data for 2025 is unavailable, therefore growth is shown for 2021–2024; for C19, growth is calculated for 2024–2025, as data for 2021–2023 is unavailable; n/a indicates the absence of data or the irrelevance of the category for a specific year.

technologies, which expands their application in less knowledge-intensive industries, where they are primarily used for process optimization and increasing operational efficiency.

As the data in Table 2 shows (constructed by the authors based on [27]), the manufacture of coke and refined petroleum products (C19) occupies a distinct position, with the highest level of AI application recorded at 45.65%

in 2025. This result is driven by the high complexity and continuity of production processes, as well as increased requirements for safety and environmental control.

The overall indicator for the manufacturing industry (Section C) grew by 15.19 p.p. between 2021 and 2025, reaching 24.38%, which signifies the integration of AI by approximately every fourth enterprise in the sector.

Thus, the results of the analysis indicate the formation of a two-circuit model of AI diffusion in industry: KTI industries perform the function of generating and testing innovations, while non-KTI industries ensure their scaling, forming an effect of broad technological diffusion.

Conclusions and recommendations. From 2018 to the present, the EU has evolved from establishing basic regulatory frameworks to a comprehensive architecture aimed at the development and integration of AI into industrial and social processes. The implementation of these strategies creates conditions for the systemic integration of technologies into production and allows for the assessment of policy effectiveness and the level of digitalization of industrial enterprises.

The study showed that in 2021–2025, the integration of AI into the EU manufacturing industry demonstrates steady growth with a clear division between high-tech and traditional sectors. KTI industry enterprises are characterized by the highest intensity of AI implementation. The pharmaceutical industry and the manufacture of computer, electronic, and optical products stand out particularly, as the concentration of digital technologies there is at its maximum. KTI industries form the core of digital transformation, ensuring high levels and rates of AI adoption, while non-KTI sectors are gradually integrating into pan-European digitalization processes. Some non-KTI sectors, notably the manufacture of coke and refined petroleum products, demonstrate the potential for accelerated technological renewal based on AI.

Germany maintains leading positions in the implementation of AI within the manufacturing industry and effectively defines EU trends. In the KTI segment, leadership is held by pharmaceuticals, the manufacture of computer, electronic, and optical products, mechanical engineering, and the production of transport equipment. AI is applied systematically and supports the transformation of traditional processes toward smart manufacturing. Non-KTI industries demonstrate a catch-up development effect. Despite lower starting levels, AI adoption rates are high, particularly in the wood, paper, and textile industries. The exceptional intensity in the manufacture of coke and refined petroleum products is explained by the complexity of technological processes, where AI controls parameters, optimizes modes, predicts failures, and increases productivity and energy efficiency. Overall, the integration of AI into Germany's manufacturing industry is systemic, and the two-circuit model–in which KTI leaders generate innovations and non-KTI sectors disseminate them–reflects the pan-European trend of digital transformation.

For Ukraine, the prospects for further research should focus on studying the implementation of AI across various types of enterprises, assessing the effectiveness of digital transformation under resource constraints, and integrating ICT and AI into traditional sectors. It is also important to identify the factors that promote or hinder the development of digital innovations. This will become particularly relevant following the launch of state statistical monitoring of AI use in enterprises in 2026, which the State Statistics Service of Ukraine plans to conduct [31].

The results of such research can serve as a scientific basis for shaping state support for innovation, bridging the technological gap, and enhancing the competitiveness of Ukraine's industry. Specifically, within the framework of implementing strategic documents on the digital development of innovation activities, it is recommended to prioritize the stimulation of high-tech sectors (pharmaceuticals, electronics, robotics), which form the core of digital transformation and generate innovative products.

It is also essential to support traditional industries to ensure a catch-up development effect through access to AI technologies, the standardization of solutions, and personnel training. When planning national AI implementation policies, European political instruments and regulatory approaches should be taken into account, which will facilitate the effective integration of Ukrainian industry into the European digital space.

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Упровадження штучного інтелекту у промисловість ЄС: аналіз тенденцій

У статті проаналізовано сучасні тенденції упровадження технологій штучного інтелекту (ШІ) у переробній промисловості Європейського Союзу. Встановлено, що з 2018 р. ЄС пройшов еволюцію від формування базових регуляторних рамок до комплексної архітектури, спрямованої на інтеграцію ШІ в економічні системи, виробничі процеси та організаційні моделі.

Виявлено, що частка підприємств, що застосовують щонайменше одну технологію ШІ, зросла з 6,93% у 2021 р. до 17,27% у 2025 р., що свідчить про перехід від фрагментарного використання до системної інтеграції ШІ у виробничі й управлінські процеси. Аналіз високотехнологічних (KTI) та традиційних (non-KTI) галузей показав чіткі структурні відмінності: у 2025 р. найвищі рівні застосування ШІ серед KTI-галузей зафіксовано у фармацевтичному виробництві (41,32%), виробництві комп'ютерної, електронної та оптичної продукції (37,44%), хімічній промисловості (28,45%), виробництві електротехнічного обладнання (25,90%) та машинобудуванні (25,45%). Це відображає високу інтенсивність цифровізації наукоємних секторів, де ШІ інтегрується у виробничі та інноваційні процеси.

Встановлено, що національні траєкторії упровадження ШІ у 2021–2025 рр. формують дві групи: 1) країни з високою початковою базою (понад 10%), зокрема Бельгія, Данія, Люксембург, Швеція, Австрія, Нідерланди, Норвегія, Німеччина демонструють сталість цифрової трансформації і концентрацію підприємств, що застосовували щонайменше одну технологію ШІ, вищу за середню по ЄС; 2) держави з нижчою стартовою базою, такі як Естонія, Литва, Ірландія та Мальта, визначаються прискореним зростанням. Для України обґрунтовано пріоритети подальших досліджень: оцінка ефективності цифрової трансформації в умовах обмежених ресурсів, інтеграція ІКТ та ШІ у традиційні виробничі й сервісні сектори, ідентифікація чинників стимулювання цифрових інновацій.

Результати дослідження можуть стати науковою основою для вдосконалення стратегічних документів щодо цифровізації економіки України, стимулювання високотехнологічних секторів, підтримки традиційних галузей через доступ до ШІ, стандартизацію рішень і навчання персоналу й урахування європейських регуляторних підходів для інтеграції української промисловості у цифровий простір ЄС.

Ключові слова: *штучний інтелект (ШІ), цифровізація, високотехнологічні галузі, державна політика, інновації, промисловість, цифрова трансформація*

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