

Chapter 1.3. AI-Driven Digital Transformation: Enhancing Business and Economic Sustainability Across Sectors

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Abstract. Digital transformation became defining factor in development of modern society and economy. It integrated technologies such as artificial intelligence (AI), big data, cloud computing, and Internet of Things (IoT), fundamentally changing ways in which businesses, governments, and citizens interacted. Amid global challenges — climate change, social inequality, and economic instability — sustainable development emerged as priority for all nations. Digital transformation offered unique opportunities for achieving Sustainable Development Goals (SDGs), adopted by United Nations, providing tools for effective management of resources, enhancing social inclusion, and minimising impact on surrounding environment. Therefore, study of impact of digital technologies, particularly AI, on promoting sustainable development at both national and global levels, was undoubtedly relevant. Based on results of existing research, analysis was conducted of how digital transformation contributed to economic growth, social integration, and environmental sustainability through optimisation of business processes, management models, and societal interactions. In particular, key questions of research became: theoretical foundations of digital transformation and its connection with strategies of sustainable development; qualitative assessment of impact of AI and digital technologies on functioning in various sectors of economy with presentation of case studies demonstrating positive effects of AI on sustainable development in ICT, economy, and business; discussion of challenges and risks associated with implementation of digital technologies, including ethical and legal considerations; development of recommendations for advancing digital transformation while adhering to principles of sustainability; examination of ethical implications of implementing tools of AI and digital technologies in context of sustainable development, with focus on ensuring fair access and minimising potential harm; determination of role of political frameworks and regulatory mechanisms in promoting sustainable digital transformation in various sectors.

Key words: Digital transformation, artificial intelligence, sustainable development, ICT strategies, digital economy, big data, cloud computing.

1. The Concept of the "Digital Economy". Digital Transformation and Its Role in the Modern World. The digital economy was an economic paradigm in which digital technologies served as the main catalysts for growth, innovation, and value creation. Unlike traditional economies rooted in physical assets and linear production processes, the digital economy used technologies such as e-commerce, digital platforms, process automation, and big data analytics to redefine how goods, services, and information were produced, distributed, and consumed. This shift introduced greater flexibility, transparency, and a data-centric approach to decision-making, fundamentally transforming economic interactions.

The digital economy was characterised by its dependence on interconnected systems and real-time data flows. For example, e-commerce platforms such as Amazon or Alibaba exemplified how digital technologies enabled seamless transactions across borders, reducing dependence on physical infrastructure while expanding market access. Similarly, digital platforms like Uber or Airbnb illustrated the rise of the sharing economy, where underutilised assets were optimised through technology, promoting efficiency and waste reduction. In the context of sustainable development, the digital economy offered transformative opportunities. It promoted economic growth by enabling scalable business models while minimising environmental impact. For instance, the shift from physical products (e.g., CDs or DVDs) to digital services (e.g., music and video streaming) exemplified dematerialisation, reducing resource consumption and waste. Moreover, digital tools could optimise supply chains, reducing carbon emissions through efficient logistics—a critical factor in aligning economic progress with environmental goals.

Globally, the digital economy was a driver of competitiveness, enabling nations and organisations to leverage technology for innovation and resilience. Locally, it empowered small and medium-sized enterprises (SMEs) by providing access to tools such as cloud computing and digital marketing, levelling the playing field with larger corporations. In Ukraine, for example, the growth of the IT sector was linked to job creation and economic diversification, contributing to national development (Klimczuk & Tomczyk, 2017).

Digital transformation was supported by a set of advanced technologies that collectively enabled organisations to adapt and thrive in a world where digital technologies were prioritised. Artificial intelligence (AI) automated complex tasks, interpreted vast datasets, and predicted future trends, making it a cornerstone of digital transformation. AI's ability to learn and adapt enhanced decision-making across various sectors. Bashynska and Khaustova (2025)

demonstrated how AI analyzed economic data to forecast trends, such as market demand or inflation rates, thereby improving strategic planning. For example, AI-based models could predict consumer behaviour, allowing businesses to optimise inventory and reduce overproduction—a practical step toward sustainability.

Big data involved the collection, storage, and analysis of vast datasets to uncover patterns and insights. This technology enabled organisations to refine processes, personalise services, and anticipate market shifts. In retail, companies like Walmart used big data to optimise supply chains, reducing waste and energy consumption. Big data, combined with AI, enhanced the formulation of sustainable development strategies in ICT, aligning technological innovations with environmental and social goals.

Cloud computing provided scalable, on-demand infrastructure for data storage and processing, democratising access to advanced technologies. For SMEs, cloud solutions eliminated need in expensive physical servers, fostering innovations without significant capital investments. For example, platforms, such as Microsoft Azure, allowed businesses efficiently scale operations, supporting economic growth (SDG 8). This flexibility was particularly relevant in the analysis of IT strategies, as highlighted by Klimczuk and Tomczyk (2017), where their role in overcoming barriers to ICT implementation was emphasized where role in overcoming barriers implementation in ICT was emphasised.

Internet things (IoT) connected physical objects — such as sensors, machines or transport vehicles — with digital networks, improving management resources and operational efficiency. In agriculture systems smart farming based IoT monitored moisture soil and weather conditions, optimising usage water (SDG 6) and increasing yield (SDG 2). Work "Impact tools AI on procedure forming strategy sustainable development and its implementation in sphere ICT" illustrated, how IoT, in pair with AI, supported sustainable practices, enabling monitoring in real time and decision-making based data (Svergun, Khaustova, & Sverhun, 2024a)

Significance digital transformation was particularly pronounced in context Goals sustainable development (SDGs), adopted Organisation United Nations in 2015 as global plan for more equitable and sustainable future. Digital technologies served powerful enablers for many SDGs, offering innovative solutions for some from most pressing world challenges. For example, digital transformation directly contributed SDG 9 (Industry, innovations and infrastructure), facilitating implementation advanced technological solutions and creation robust digital infrastructure. This included development smart cities,

advanced manufacturing systems and resilient communication networks, which all supported industrial progress and innovations.

Similarly, digital transformation supported SDG 13 (Struggle with change climate), optimising usage resources and reducing ecological footprint. Technologies, such as smart grids, precise agriculture and systems monitoring environment in real time, allowed organisations minimise consumption energy, reduce waste and mitigate emissions carbon. For example, integration sensors and analytics data in industrial processes could lead to significant savings energy, aligning economic growth with ecological management.

Digital technologies directly supported Goals sustainable development (SDGs). IoT helped in management water resources (SDG 6) and food security (SDG 2), while AI optimised usage energy in production (SDG 7) and reduced emissions (SDG 13). Big data improved economic planning (SDG 8), and cloud computing fostered innovations (SDG 9). Together they created technological ecosystem, which drove sustainable progress.

Digital transformation not only accelerated economic growth, but also provided pathways for solving global problems, such as poverty, inequality and ecological crises. For example, AI could optimise usage natural resources, forecast ecological catastrophes and improve access to education and healthcare through personalised digital solutions. In sector ICT digital technologies ensured more efficient and transparent systems management, contributing achievement SDGs, such as Goal 9 (Industry, innovations and infrastructure) and Goal 16 (Peace, justice and strong institutions). In Ukraine project "Diia" was example that, how digital transformation in state management simplified interaction citizens with government, increased transparency and improved efficiency services (Svergun, Khaustova, & Sverhun (2024b)). In business-sector AI transformed models services, allowing companies personalise offerings and optimise processes, which increased competitiveness (Kasych, Yakovenko, & Tarasenko, 2019). In economy AI was applied for forecasting trends, which facilitated more informed decision-making. However implementation digital technologies was accompanied challenges, such as risks cybersecurity and ethical dilemmas. For countries with economies, that developed, such as Ukraine, was important overcome infrastructural and educational barriers for integration in global market IT.

Key discussion in theoretical debate on issues of digital transformation and its critical connection to sustainable development established conceptual framework, highlighting how technologies such as AI, big data, cloud computing and Internet of Things (IoT) contributed to innovations and efficiency. This

methodological clarity ensured that subsequent empirical findings — derived from real-world applications of AI in sectors such as ICT, public administration and business-services — were both reliable and reproducible. Significant portion of monograph was dedicated to presenting empirical data and case-studies that illustrated specific impacts of AI. For example, Varian (2014) demonstrated how AI enhanced accuracy of economic forecasting, while Svergun, Khaustova, and Sverhun (2024b) showed how AI streamlined public services through platforms such as Ukraine's "Diia," and Prokopenko, Kudrina, and Omelyanenko (2018) highlighted how AI optimised business operations in the service sector. These examples underscored potential of technology to drive economic resilience, governance transparency and operational efficiency — key pillars of sustainable development.

At the same time, it was necessary to note complexities in digital transformation, which were associated with challenges and risks such as cybersecurity threats, ethical dilemmas, and digital illiteracy, as recognized by IT professionals (Klimczuk & Tomczyk, 2017)

Focusing on Ukraine, to mitigate aforementioned challenges, it was advisable to implement strategies of promoting IT-business with sustainability in mind. According to estimates by Gaida and Verety (2024), potential of sector's growth was 20-25% annually, reflecting pre-war rates of industry development and its capacity for recovery under favourable conditions. At same time, as noted by Sabadyshyna (2024), in 2024 export of IT-services decreased by 4% due to impact of war. Despite these circumstances, as well as infrastructure limitations and difficulties in retaining skilled personnel, IT-sector demonstrated high resilience: according to Business Censor (2025), number of IT-companies in Ukraine increased by over 40% in recent years, indicating significant potential for further development. Among directions of strategic development, public-private partnership and educational reforms within public administration and governance were deemed appropriate, which would enhance inclusiveness and maximisation of societal benefits from technologies.

The theoretical assertion that AI optimizes resource use was supported by empirical evidence from its application in ICT, as shown by Svergun, Khaustova, and Sverhun (2024a), while concerns of stakeholders regarding data privacy raised by International Monetary Fund (2020) necessitated discussion of ethical challenges. Therefore, the application of a comprehensive approach to forming protocols for the implementation and use of AI tools was expected to ensure the utilization of advantages of digital innovation alongside the realization of sustainable development goals (see Table 1).

Table 1. Role of Artificial Intelligence in Achieving Sustainable Development Goals (SDGs)

SDGs	The Use of AI in Achieving the SDGs
1. Struggle with poverty	Usage of AI in agriculture contributed to improvement of cultivation of soil, growing of plants, and husbandry of animals. AI influenced reduction of poverty through collections of data with help of maps of poverty, improvement of agriculture and education, and revolutionisation of systems of finance.
2. Overcoming of hunger	Systems of early warning based on AI could indicate shortage of food, which contributed to making of decisions for prevention of malnutrition. AI transformed systems of nutrition and agriculture, maximising productivity and efficiency with help of management of crops, which contributed to achievement of SDG 2.
3. Strong health and well-being	Optimisation of delivery of services of medicine, development of analytics, and establishment of standards of ethics in this sphere were tasks critical for ensuring of accessibility, quality, and efficiency of care of medicine.
4. Quality education	Development of mentors virtual, automation of creation of textbooks, learning personalised, etc.
5. Gender equality	Intelligence artificial could help avoid bias double during interrogations, simulating similarity racial, ethnic, cultural, and linguistic of suspect. Researchers also found that AI was useful not only in interrogations but also in situations many other.
6. Clean water and sanitation	AI improved services of supply of water and sanitation and supported operations of treatment of waters sewage, regulating management predictive.
7. Accessible and clean energy	Sector of energy in countries developed industrially already began to implement AI and technologies related for ensuring of grids smart, devices of monitoring, and devices IoT for management of energy, forecasting, and reduction of emissions.
8. Decent work and growth economic	Usage of technologies of AI in production of products and services contributed to increase of efficiency and productivity, reduction of cost of capital, increase of wages.
9. Industry, innovations, and infrastructure	Optimisation and automation of making of decisions in industry meant implementation of systems that helped in improvement of processes of production, reduction of costs, and increase of quality of products. Implementation of learning deep in sphere of innovations meant usage of this technology for development of products new, services, or solving of tasks complex that stood before teams research or development. Usage of learning deep for improvement of management of resources, planning of development of cities, and usage efficient of networks of transport.
10. Reduction of inequality	AI contributed to growth economic, ensured access to education and services of medicine, reduced influence of biases in making of decisions, and promoted inclusion financial, and also played role key in creation of society more just and equal.
11. Sustainable cities and communities	AI ensured management efficient of services urban, optimisation of processes of management of wastes, and control of quality of air, which contributed to creation of cities sustainable and comfortable for life.
12. Responsible consumption and production	AI could facilitate making of decisions responsible socially and environmentally, and also had potential to reduce emissions global of gases greenhouse, using learning machine for optimisation of consumption, forecasting, and prevention of wastes of food.
13. Struggle with change of climate	Usage of learning machine and data big for reduction of emissions and support of measures on change of climate contributed to creation of future more sustainable and safe environmentally. AI not only allowed to fight more effectively with change of climate but also ensured solutions grounded scientifically for adaptation to conditions new.

SDGs	The Use of AI in Achieving the SDGs
14. Preservation of ecosystems marine	AI and learning machine could help monitor fishing illegal, unregulated, and uncontrolled, reducing wastes in chains of supply and improving monitoring of movement of fleets of fishing, and also could contribute to solving of problems of pollution of ocean.
15. Preservation of ecosystems of land	Usage of learning machine for forecasting of deforestation and analysis of data big for determination of factors that caused deforestation and degradation of lands.
16. Peace, justice, and institutions strong	AI was capable to automate processes of making of decisions in aspects various of activity legal and governmental, contributed to increase of safety of citizens through implementation of systems intelligent of surveillance and analysis of data. Thanks to usage of AI, institutions state and private could become more transparent and accountable.
17. Partnership for goals	Development of cooperation global and partnership in promotion of exchange of knowledge, experience, technologies, data, and interconnections for achievement of SDGs in world whole.

Source: systematized by the authors

Based on theoretical propositions about understanding role of digital transformation in sustainable development, interpretation of its significance lay in strategic integration of technologies that fundamentally changed organisational and societal operations, aligning with global priorities (SDG 9 Industry, Innovations and Infrastructure and 13 Struggle with Change of Climate). Noted connection demonstrated how tools based on AI in ICT optimised efficiency of resources, reducing emissions of carbon and supporting ecological management.

In sphere of economy, AI improved forecasting of GDP, helping policymakers in allocation of resources — direct contribution to SDG 8 (Decent Work and Economic Growth). In public administration, platform "Diia" was example of how digital tools improved accessibility and transparency of services, advancing SDG 16 (Peace, Justice and Strong Institutions) (Svergun, Khaustova, & Sverhun, 2024b). Meanwhile, in business-sector, innovations based on AI (chat-bots and DATA-analytics) increased satisfaction of clients and operational efficiency, enhancing economic resilience. Brought facts composed proofs of prospects of transformation through digital technologies.

Research, which was conducted, relying on analysis of PwC (2024), showed that greatest economic benefits from application of artificial intelligence (AI) would be received by China and North America. Specifically, growth of GDP of China by 26% to 2030 was forecasted, while in North America increase by 14.5% was expected, which in aggregate was equivalent to 10.7 trillion US dollars and constituted approximately 70% from total global economic impact. Overall, according to estimates, AI could add to world economy up to 15.7 trillion US dollars to 2030, which exceeded current aggregate GDP of China and India. From this sum, 6.6 trillion US dollars fell on increase of productivity, and 9.1 trillion

US dollars were expected from effects related to consumption (Figure 1). Despite different level of readiness of markets and progress in individual sectors, AI on global level was at early stage of development. Macroeconomic analysis indicated that countries with markets that were developing had potential to outpace more developed markets through active implementation of technologies of AI. Besides, in some branches of business, significant changes in market leadership were possible, when current startups or companies that were not yet created could become leaders during next decade (PwC, 2024).

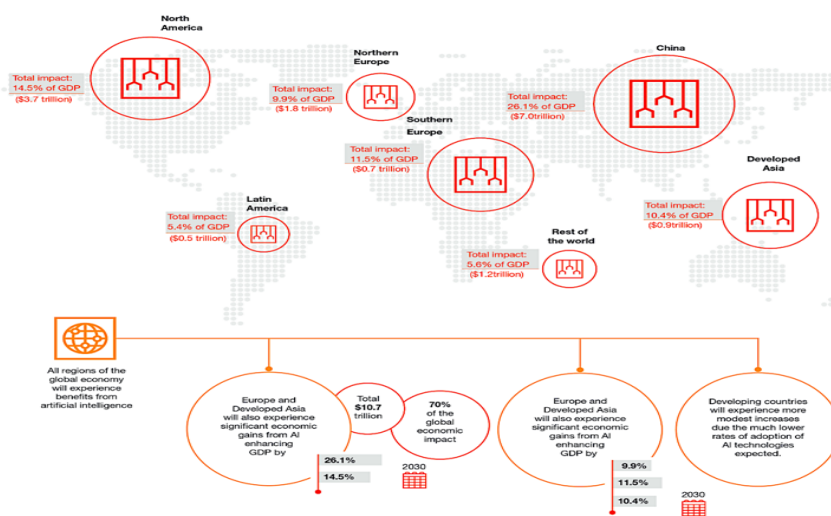


Figure 1. Total impact of AI to 2030

Source: <https://nayka.com.ua/index.php/investplan/issue/view/157>

Recognizing that digital transformation was not deprived of obstacles, arose necessity in critical evaluating of its challenges. Risks of cybersecurity, ethical concerns, and inequality in access constituted significant obstacles for wide implementation. For example, survey of IT-specialists showed that 60% were concerned about confidentiality of data, which underlined necessity in strong regulatory frameworks. Considering given moment was deemed advisable to conduct balanced policy through simultaneous decisions regarding ethical limitations for AI and regarding investments in infrastructure, to soften risks and ensure fair benefits.

Concentrating on IT-sector in Ukraine, despite strong trajectory of growth, sector encountered with challenges, such as gaps in infrastructure of rural districts and emigration of talents. In this connection logical appeared strategic measures from expansion of access to broadband internet to promotion of local innovative hubs, which in whole aimed at strengthening of positions of Ukraine as IT-hub,

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supporting at this SDG 9. Corresponding strategies and ICT were grounded on possibilities with reduction of costs on energy, which ensured their reality and relevance.

Confirming role of AI as catalyst of sustainable development, was possible to state such directions of usage of its tools: improved forecasting, strengthened management, and business-innovations, at same time recognising stable barriers. Looking into future, perspective of development of AI should ensure alignment of technological progress with social and ecological goals. Such approach went beyond limits of simple structural review, weaving detailed narrative, which reflected complexity and advantages of digital transformation, which had to be adapted to Ukrainian context.

Digital transformation concerned strategic and systematic integration of digital technologies into all aspects of organisational or societal activity, fundamentally changing that, how subjects functioned and created value. Far not being simply technological renewal or automation of existing processes, digital transformation required deep rethinking of business-models, paradigms of management, and ways of interaction with clients, citizens, or stakeholders. Its final goals were to raise operational efficiency, strengthen competitiveness, and promote sustainability in all more interconnected and technologically oriented world.

In modern epoch of globalisation and rapid technological evolution digital transformation became critical factor of success as for private enterprises, so for state institutions. It surpassed traditional boundaries, allowing organisations to adapt to dynamic market conditions, flexibly react on expectations of clients, and use data for constant innovations. For business this could mean transition from orientation on product to service-oriented models, and for governments — digitalisation of state services for improvement of accessibility and transparency.

Besides these concrete examples, digital transformation promoted change of paradigm, which echoed in economic, social, and ecological spheres. It gave organisations possibility to solve complex global challenges — poverty, inequality, and change of climate — using technologies for creation of scalable, inclusive, and sustainable solutions. For example, digital platforms could fill gaps in education (SDG 4), providing possibilities for remote learning, whereas initiatives of telemedicine could improve access to medical services (SDG 3) in insufficiently served regions. Given facts positioned digital transformation as catalyst of holistic progress, making it irreplaceable tool in modern world.

2. IT-strategies and their connection with strategies of sustainable development. IT-strategies encompassed plans and methodologies that

organisations used for integration and management of information technologies in achievement of strategic goals. Within digital transformation, IT-strategies filled gap between technological possibilities and sustainable results, ensuring effective usage of digital tools. IT-strategies contributed to sustainable development in three key ways:

- **Optimisation of resources:** Automation and digitalisation reduced consumption of energy and materials. For example, predictive maintenance based on AI in industry minimised breakdowns of equipment, reducing wastes and supporting SDG 12 (Responsible consumption and production). Digital platforms, such as "Diia", optimised administrative processes, reducing load on state bodies and decreasing expenditures of time and resources on provision of services, which contributed to SDG 12 (Responsible consumption and production). Automation and digitalisation with help of AI significantly optimised economic analysis, allowing economists and analysts to process large volumes of data more quickly, reveal hidden patterns and forecast economic trends, such as changes in market of labor, consumer expenditures or macroeconomic indicators, which reduced expenditures of time, human resources and financial risks, for example, through rapid detection of fraud in real time, contributing to sustainable economic growth and increase of efficiency of economic decisions in accordance with SDG 8 (Decent work and economic growth).

- **Improved Access to Services:** Digital platforms enhanced inclusivity, simplifying access to essential services. The Ukrainian platform "Diia", analysed in my article, optimised citizens' interaction with the government, reducing bureaucratic barriers and supporting SDG 10 (Reduced Inequalities) and SDG 16 (Peace, Justice, and Strong Institutions) (see Table 1).

- **Stimulation of innovations:** IT-strategies promoted development of solutions for pressing problems. Fintech-innovations, such as mobile banking, contributed to financial inclusion (SDG 1), whereas technologies of smart cities reduced pollution of cities (SDG 11).

Among practical aspects was distinguished transformation of business-model in sphere of services under influence of AI, which was connected with increase of competitiveness and adaptability. For example, chat-bots based on AI improved efficiency of servicing of clients, reducing operational costs and supporting economic resilience. This demonstrated how IT-strategies transformed theoretical concepts into tangible benefits.

Concrete examples of application of digital transformation and IT-strategies in different sectors illustrated their practical relevance and adaptability. In sphere

of information-communication technologies (ICT), artificial intelligence (AI) formed strategies of sustainable development, connecting technological achievements with Sustainable Development Goals (SDGs) 9 — focused on industry, innovations and infrastructure — and 13, which was directed at struggle with change of climate. This research demonstrated capability of AI to optimise usage of resources and solve ecological problems. Similarly, platform "Diia" in state management improved provision of services and transparency in Ukraine, aligning with emphasis of SDG 16 on peace, justice and strong institutions. In sector of services, transformational influence of AI increased economic resilience through optimisation of processes and improvement of client experience. Meanwhile, article on application of AI in economic forecasting was aimed at improvement of decision-making through provision of accurate forecasts of market trends and needs in resources. On whole, digital transformation at national level stimulated economic growth, despite infrastructural and personnel challenges.

In aggregate, brought positions composed practical basis for theoretical positions in research of digital transformation as factor of sustainable development. Practical aspects of digital transformation and IT-strategies underlined their critical role in advancement of sustainable development. Technologies, such as AI, big data, cloud computing and IoT, provided powerful tools for optimisation of processes, improvement of access to services and promotion of innovations.

3. Overview of features of application of methods of evaluation of influence of digital technologies on sustainable development. Justification of methods of evaluation of influence of digital technologies on sustainable development was determined by complexity, multidimensional nature of digital transformation, which encompassed economic, social, and ecological aspects. Overview of research methods was limited to main of them, namely:

- *Quantitative analysis of data:* Usage of statistical tools and machine learning for analysis of large sets of data and testing of hypotheses.
- *Case-studies:* Conducting of detailed qualitative researches of concrete implementations of digital technologies.
- *Surveys:* Collection of structured feedback from stakeholders for understanding of their views on AI and digital strategies.

These approaches were chosen for ensuring of comprehensive analysis. Quantitative methods revealed broad patterns, case-studies offered deep insights, and surveys reflected perspectives of those who were involved in or experienced influence of digital transformation.

Quantitative analysis of data. Quantitative analysis of data was justified for researches that concerned economic trends and forecasting. For example, in article "Usage of artificial intelligence in economy" was applied techniques of machine learning — such as neural networks and regression analysis — to sets of data of economic indicators, such as GDP, inflation, and level of employment. This allowed to reveal complex, nonlinear patterns and improve accuracy of forecasting compared to traditional econometric methods (Varian, 2014)

Similarly, in article "Influence of tools of AI on procedure of forming of strategy of sustainable development and its implementation in sphere of ICT" was used statistical analysis for evaluation of how digital technologies could contribute to achievement of SDGs, whereas AI and machine learning improved energy efficiency and reduced costs on electricity (Svergun et al., 2024a)

This method ensured objectivity and scalability, but strongly depended on quality of data and assumptions of model. For solving of these challenges were used verified sets of data and techniques of cross-validation for increase of reliability.

Case-studies. Case-studies provided qualitative prism for research of real applications of digital transformation. On basis of studying of normative documents, feedbacks of users, and data about productivity, analysis of functioning of Ukrainian platform "Diia", portal of digital state services, showed improvement of transparency and access to services, aligning with Sustainable Development Goal 16 (Peace, justice, and strong institutions).

In article "Features of influence of AI on development of business in sector of services" was considered implementation of AI in Ukrainian sphere of services. Based on company reports and customer satisfaction scores, the study demonstrated how artificial intelligence improves service quality and reduces costs, contributing to economic sustainability.'

Case-studies were distinguished in revealing of nuances of implementation of technologies in concrete conditions. Although they were less generalisable, they enriched quantitative conclusions with practical, context-specific evidences.

Surveys. For collection of data about perception of artificial intelligence (AI) in different groups of population was conducted survey from February to March 2025, which covered 50 participants from different professions, age groups, and sectors, including ICT. Survey was conducted in two formats: anonymous and open, depending on choice of respondents. For ensuring of representativeness of sample was applied stratified random sampling, which allowed to include representatives of different sectors (state and private organisations of ICT) and organisations. Questionnaire was tested for clarity and

reliability (Cronbach's alpha coefficient was 0.82), and bias was minimised thanks to neutral formulation of questions and possibility of anonymous provision of answers at wish of respondents.

Responses of respondents were analysed with help of methods of descriptive statistics (mean value, standard deviation, frequency analysis) and factor analysis for revealing of main trends and interconnections between variables. This methodological approach allowed to take into account experience and perception of respondents in research, ensuring its justification.

Results of survey showed that among workers of ICT-sector highest level of usage of AI was observed among programmers: 60% of respondents of this category used AI, from them 40% applied it on permanent basis, and 20% used for search of information. Overall, 90% of surveyed supported development of AI, 5% expressed cautious attitude, and another 5% were categorically against. Analysis by age groups revealed that greatest support of AI was expressed by youth (18–35 years) and workers aged 45–55 years, whereas respondents aged 56–65 years more often expressed doubts, and greatest share of opponents of AI was observed among persons of pre-retirement age (66–70 years). (Figure 2).

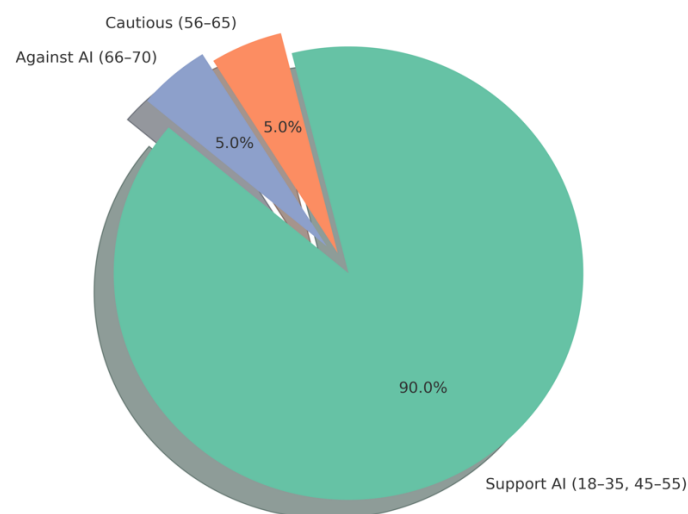


Figure 2. Attitudes toward AI among ICT workers by age group

Source: developed by the authors

Combining quantitative analysis, case studies, and surveys in research, an integrated approach was obtained through the complementation of one method by another. Thus, quantitative analysis offered a general picture, case studies provided detailed examples, and surveys added stakeholders' perspectives. This integrated approach was ideal for studying digital transformation, which required

both empirical data and contextual understanding. The trio of methods formed a comprehensive toolkit for investigating how digital transformation and AI contributed to sustainable development. These approaches not only tested theoretical ideas but also provided actionable insights for businesses, policymakers, and scholars.

Empirical studies on the contribution of digital technologies and AI to sustainable development. The research had to include three key research questions:

- How did AI improve economic forecasting?
- What were the practical effects of digital transformation in the public and business sectors?
- What challenges and opportunities did stakeholders perceive in the use of AI?

The empirical research covered several dimensions of sustainable development. Economically, it assessed how AI-based tools improved forecasting and decision-making. Socially, it explored the implications of accessibility and equality of digital transformation. From a governance perspective, it examined how technologies reshaped public administration and citizen engagement. By considering these areas, the research aimed to provide actionable insights for stakeholders seeking to leverage digital innovations for sustainable outcomes.

Accurate economic forecasts enabled by AI offered several advantages:

- *Efficient resource allocation:* Governments could anticipate economic cycles and adjust fiscal or monetary policy to support stability, ensuring resources were directed where they were most needed.
- *Risk reduction:* Businesses could use AI insights to make strategic decisions, reducing financial vulnerabilities during market downturns.
- *Support for emerging sectors:* Data indicated growth opportunities in industries such as renewable energy and digital services, which were poised to create jobs and stimulate sustainable economic progress.

For example, AI's ability to forecast labour market trends could inform targeted training programmes, aligning workforce skills with future needs in green technologies or digital infrastructure. This forward-looking approach enhanced economic resilience and reduced unemployment risks, contributing to long-term sustainability.

To confirm the above, the performance of the AI model was compared with forecasting techniques used by central banks and international organisations, such as the International Monetary Fund (IMF). Traditional models, which often relied on static assumptions, lagged in adapting to rapid changes or nonlinear trends. In

contrast, the flexibility and data-driven nature of AI models positioned it as a valuable tool in today's interconnected and unpredictable global economy. Beyond GDP forecasting, the quantitative approach in the article had implications for other economic areas. For example, AI could predict inflation trends, guiding central banks in setting interest rates, or assess employment shifts, aiding in the design of social safety nets. These applications underscored AI's transformative potential in economic planning and its alignment with sustainable development priorities.

An example of digital transformation in governance was the Ukrainian platform "Diia," which was a pioneering digital platform introduced by the Ukrainian government to consolidate and streamline public services, making them accessible to citizens through a single online portal or mobile application. This platform allowed users to perform various tasks — from obtaining digital documents (e.g., passports, driver's licences), paying taxes, registering businesses, to accessing social benefits — without the need for in-person visits to government offices.

The core strength of "Diia" lay in its user-centric design, which emphasised accessibility and efficiency. For instance, citizens could use the platform to digitally authenticate their identity, access COVID-19 vaccination certificates, or complete business registration in under 30 minutes. My research showed that the implementation of "Diia" led to a 30% increase in service productivity and a 25% reduction in application processing time. These improvements stemmed from the platform's ability to automate workflows and eliminate redundant bureaucratic steps that had historically slowed service delivery in Ukraine.

The platform's impact was not limited to efficiency gains alone. By digitising citizen-government interactions, "Diia" reduced opportunities for corruption, as manual interventions and cash transactions were minimised. Every action on the platform was logged electronically, enhancing traceability and accountability. This closely aligned with Sustainable Development Goal 16 (Peace, Justice, and Strong Institutions), which called for transparent, inclusive, and responsive governance structures. In a country like Ukraine, where trust in institutions had been eroded by years of political instability and corruption, "Diia" represented a vital step toward rebuilding trust and fostering civic engagement.

Diia's contribution to social inclusion was also noteworthy. By offering services online, the platform overcame geographical and physical barriers, making government resources more accessible to underserved populations — rural residents, the elderly, or individuals with mobility impairments. For example, a farmer in a remote village could now renew a licence or apply for

subsidies without travelling to a distant administrative centre. The platform's multilingual interface and intuitive design further broadened its reach, accommodating Ukraine's diverse population.

However, success of "Diia" was overshadowed by challenges that needed to be overcome to fully realise its potential. Digital literacy remained significant obstacle, particularly among older generations and rural communities unfamiliar with technologies. Besides that, inequality in access to internet — particularly in regions affected by conflict or insufficiently developed — restricted universality of platform. Cybersecurity was yet another critical issue, since centralisation of sensitive personal data increased risk of leaks. My analysis indicated that resolution of these problems demanded multifaceted approach, including investments in digital education, expansion of broadband infrastructure, and strong measures of data protection. Achievements of "Diia" offered valuable lessons for other countries that aspired to modernise state governance. Its success highlighted transformational potential of digital tools in enhancement of service provision, promotion of transparency, and advancement of sustainable development. As governments across world contended with demands of digital era, "Diia" served as reproducible model for utilisation of technologies for purpose of creation of more resilient and inclusive institutions.

Tools of AI in sector of services expanded thanks to operation of chatbots and predictive analytics, which enriched client experience, optimised utilisation of resources, and encouraged economic resilience in sector of services:

- **Chatbots:** Company introduced chatbots based on AI for management of routine inquiries of clients, such as disputes regarding bills, updates of account records, or requests for technical support. These virtual assistants, accessible 24/7, reduced average time of response by 40%, which enabled quicker resolution of problems of clients. Apart from speed, chatbots enhanced consistency in quality of servicing, since they delivered standardised, error-free responses. This automation also eased pressure on human personnel, permitting them to concentrate on more intricate inquiries that necessitated empathy or creativity.

- **Predictive analytics:** Employing machine learning, company examined historical data for prediction of needs of clients and operational challenges. For example, predictive models detected regularities in utilisation of network, which permitted firm to address issues with overloading or breakdowns of equipment in advance. This proactive approach diminished downtime of equipment by 15%, minimising interruptions in servicing and associated expenses. Besides that, predictive analytics guided targeted marketing campaigns, elevating retention of clients through personalised propositions.

Combined effect of these tools of AI resulted in 20% rise in satisfaction of clients, as demonstrated by surveys following interaction. Clients especially appreciated seamless, personalised experiences facilitated by AI, such as receipt of proactive notifications about potential issues with servicing or individualised recommendations regarding tariff plans.

Introduction of AI yielded substantial economic advantages for telecommunication company. By automation of repetitive tasks, firms managed to lower operational costs and reallocate human resources to innovative projects, such as development of new digital services. Predictive analytics, meanwhile, refined schedules of maintenance and management of inventories, diminishing waste and elevating efficiency of resources. These outcomes conformed with principles of economic sustainability, since they enabled company to stay competitive in market that evolved rapidly, whilst minimising its environmental impact.

From strategic viewpoint, application of AI permitted companies to establish themselves as foremost leaders in sphere of client-oriented innovations. Capacity to foresee and effectively address needs of clients not only fostered enhancement of their loyalty but also considerably bolstered reputation of brand, initiating positive cycle of economic growth and augmentation of profitability. Specifically, insights obtained through predictive analytics unveiled new possibilities for cross-selling of services with added value, which secured creation of supplementary sources of revenue without necessity of substantial capital investments.

Despite its successes, integration of AI introduced challenges that demanded attention. Confidentiality of data emerged as principal concern, considering enormous volumes of personal information processed by chatbots and analytical systems. Company reacted by introduction of strict protocols of encryption and transparent policies of data usage, but continual vigilance was required for preservation of trust of clients. Besides that, risk of algorithmic bias — when systems of AI unintentionally prioritised certain groups of clients — necessitated regular audits and updates for assurance of fairness. Finally, initial expenses on deployment of AI, encompassing development of software and training of personnel, established barrier that smaller firms might find difficult to surmount. This case study illustrated how AI could transform sector of services, elevating efficiency, satisfaction of clients, and economic resilience. However, it also emphasised significance of balancing technological innovations with ethical and practical considerations for assurance of equitable benefits.

4. Results of survey: opinions of stakeholders regarding usage of AI. To provide broader perspective on role of AI in digital transformation, was conducted anonymous survey of 80 IT-specialists and engineers of leading providers in Ukraine, such as PJC Datagroup/Volia, and Ukrposhta, which showed attitude of engineers to AI, focusing on its perceived advantages, challenges, and consequences for policy and practice. Participants were asked to evaluate influence of AI on their industries, identify barriers for implementation, and propose strategies for their overcoming. Key findings included:

Perceived advantages: 80% of respondents viewed AI as key driver of competitiveness, referring to its ability to optimise operations, reduce costs, and enable innovations. Many pointed to concrete examples, such as automation of data analysis or personalisation of interactions with clients, as proof of its value. Despite this optimism, 40% expressed concern regarding confidentiality of data and ethical dilemmas. Respondents worried that systems of AI could compromise sensitive information or lead to biased results if not controlled properly.

Using factor analysis of responses of survey, three main challenges could be distinguished:

1. *Shortage of qualified personnel* - recurring theme was shortage of experts qualified in development and implementation of AI. Respondents noted that education system of Ukraine had not yet fully adapted to demand for specialists in data, engineers in machine learning, and other specialised roles, which created bottleneck for projects of AI.

2. *High costs of implementation* - financial investments required for AI — encompassing hardware, software, and training — were significant deterrent, particularly for small and medium enterprises (SMEs). Several participants emphasised complexity of justification of these costs without guaranteed short-term returns.

3. *Regulatory uncertainty* - ambiguity in legal frameworks regulating AI, such as responsibility for autonomous decisions or rights of intellectual property, generated hesitation. Stakeholders called for clearer regulations for reduction of risks and encouragement of implementation.

4. *Shortage of experienced courses and training programmes* - Absence of quality and practical educational programmes oriented at preparation of specialists in AI became significant obstacle. Participants of research noted that available courses often did not meet modern requirements of market, lacked practical experience and access to up-to-date tools, which complicated preparation of personnel capable of working effectively with technologies of AI.

Results of survey revealed dual narrative: enthusiasm regarding potential of AI, restrained by practical and ethical concerns. For overcoming of these barriers, policymakers needed to prioritise development of workforce through targeted educational programmes, such as partnerships with universities or professional training in skills of AI. Financial incentives, such as subsidies or tax benefits for SMEs implementing AI, could alleviate obstacles related to costs. Besides that, establishment of strong regulatory framework — encompassing protection of data, accountability of algorithms, and ethical standards — would provide businesses with confidence necessary for investment in AI with certainty.

These findings had broader implications for sustainable development. By fostering ecosystem where AI could thrive, governments and industries could unlock its potential for stimulation of economic growth, enhancement of service provision, and resolution of societal challenges, whilst ensuring fair and responsible implementation.

Despite these technological achievements, significant structural and human capital challenges constrained development of IT-sector in Ukraine. Main obstacle was deficit of infrastructure, particularly pronounced in rural and conflict-affected regions. Whereas urban hubs, such as Kyiv and Lviv, enjoyed robust digital ecosystems — with high-speed internet and modern facilities — smaller towns and remote areas often lacked reliable connectivity. This digital divide restricted scalability of IT-oriented businesses and impeded even economic growth across country.

In context of development of cloud technologies and implementation of artificial intelligence, which contributed to optimisation of business-processes, research conducted relying on report of ITU (2023), highlighted key elements of strategic development of ICT-sector. Specifically, as of 2023 year access to Internet had 5.4 billion persons, which constituted 67% of population of world, demonstrating growth by 45% compared to 2018 year, when quantity of new users increased by 1.7 billion. At same time 2.6 billion persons remained without access to Internet, which emphasised problem of digital inequality. Besides that, significant progress observed in deployment of infrastructure of 5G, which covered approximately 70% of market, providing higher speed of transmission of data and creating new possibilities for development of cloud intelligence, Internet of Things (IoT) and other digital technologies. Cloud intelligence, in its turn, played important role in enhancement of productivity, specifically in ICT-sector, where 85% of leading companies used AI and digital innovations for automation of business-processes. These data testified to significant potential of cloud

technologies for transformation of economy and emphasised importance of their integration into strategies of development of ICT (ITU, 2023).

Besides that, retention of talents emerged as critical problem. Ukrainian IT-workforce was highly qualified, however many professionals attracted by possibilities abroad due to higher salaries, better conditions of work and geopolitical uncertainties. As consequence, significant quantity of Ukrainian IT-specialists considered relocation abroad within five years, motivated by limited prospects of career growth at homeland. This brain drain threatened capability of sector to maintain its pace of growth and compete at global level. Despite these challenges, Ukrainian IT-sector demonstrated extraordinary resilience. Development supported thanks to local innovations and growing global demand for IT-services.

Growth of IT-sector directly supported Goal of sustainable development 9 (Industry, innovations and infrastructure), contributing to technological progress and creating high-value possibilities for employment. However, support of this trajectory required strategic interventions. Expansion of broadband access to insufficiently served regions could stimulate local entrepreneurial spirit, reduce regional disparities and promote inclusive growth. Similarly, strengthening of STEM-education (science, technology, engineering and mathematics) and implementation of incentives — tax benefits or subsidised coworkings — could deter emigration of talents and ensure stable flow of qualified professionals. To utilise potential of sector, at same time addressing its challenges, proposed bidirectional policy approach:

Expansion of infrastructure: Public-private partnerships could accelerate deployment of high-speed internet in rural areas, utilising funding from international donors or technological corporations. Such initiatives would strengthen connectivity and open new markets for IT-businesses.

Development of talents: Creation of innovative hubs or incubators in collaboration with universities would contribute to development of local talents, providing practical training and possibilities for career development in Ukraine.

By addressing these structural and human capital gaps, Ukraine could strengthen its positions as growing IT-hub, at same time advancing its goals of sustainable development.

Quantitative analysis showed that forecasting models based on AI outperformed traditional econometric approaches, that growth of state investments in infrastructure usually caused increase of GDP by 2–3% within year (Varian 2014). This improvement enhanced allocation of resources and economic planning, permitting government and business to anticipate market

shifts and mitigate risks. For example, capability of AI to model effects of policy changes or external shocks — disruptions in trade — supported more resilient economic systems. This conclusion directly aligned with SDG 8 (Decent work and economic growth), contributing to stability and efficiency, which were critical for long-term prosperity. However, these achievements had caveats. Opacity of some models of AI could undermine trust in their forecasts, whereas reliance on potentially biased or incomplete sets of data risked perpetuating economic disparities. To maximise advantages of AI for sustainable development, transparency and integrity of data had to be prioritised.

Case study of the Ukrainian platform "Diia," detailed in an article by Svergun, Khaustova, and Sverhun (2024b), demonstrated how digital technologies could transform state governance. By digitising services, "Diia" increased productivity by 30% and reduced processing time by 25%, enhancing transparency and curbing corruption. By digitising services, "Diia" increased productivity by 30% and reduced processing time by 25%, enhancing transparency and curbing corruption. These results supported SDG 16 (Peace, Justice, and Strong Institutions), strengthening governance and restoring public trust, especially in post-conflict or transitional settings. However, digital divide constituted significant barrier. Rural and underserved populations often lacked infrastructure or skills to access such platforms, risking exclusion from these benefits. This tension underscored need for inclusive policies to ensure equitable participation in digital governance initiatives.

Case study of telecommunications company in article by Huang and Rust (2018) illustrated impact of AI on operational efficiency. By integrating chatbots and predictive analytics, company reduced customer response time by 40%, leading to increase in customer satisfaction. These gains enhanced business competitiveness and resource efficiency, contributing to economic resilience and indirectly supporting SDG 9 (Industry, Innovation, and Infrastructure).

Ethical challenges arose here as well. Automation raised concerns about privacy due to extensive data collection, and overreliance on AI threatened to diminish human interaction in service provision. Businesses needed to balance efficiency with robust data protection and human oversight to maintain trust and fairness.

Survey data indicated that 80% of IT professionals and business leaders considered AI vital for competitiveness, but 40% expressed concerns about privacy and ethics. This duality reflected broader tension between innovation and responsibility. Barriers such as talent shortages and high costs further complicated AI adoption, especially for small enterprises. Overcoming these

obstacles required investment in education, regulatory clarity, and support for marginalised stakeholders, aligning with SDG 10 (Reduced Inequalities).

Collectively, findings suggested that AI and digital technologies were powerful enablers of sustainable development through:

- *Economic resilience* - improved forecasting and operational efficiency supported SDG 8 and SDG 9, driving growth and innovation.
- *Governance enhancement* - digital tools promoted transparency and inclusivity, advancing SDG 16.
- *Social equity* - Addressing access and ethical challenges was necessary to prevent deepening inequalities, supporting SDG 10.

However, transformative potential of these technologies was constrained by challenges. Digital divide, ethical risks, and resource disparities could undermine sustainability if not addressed. Coordinated approach involving policy, industry, and research was needed to ensure that technological progress benefited all segments of society.

Several critical issues arose:

- *Data privacy and bias* - AI systems needed to be designed to protect user data and avoid reinforcing systemic biases.
- *Accessibility* - bridging digital divide required investment in infrastructure and education.
- *Human displacement* - impact of automation on jobs necessitated retraining programmes to safeguard livelihoods.

Addressing these challenges involved establishing ethical standards for AI, improving digital literacy, and fostering cross-sector collaboration. Only through such measures could promise of sustainable development be fully realised.

AI and digital technologies held immense potential for sustainable development, offering tools to address economic, social, and governance challenges. However, their success depended on commitment to fairness, ethics, and collaboration. Ukraine's digital journey, as explored here, provided compelling example of how technologies could drive progress when guided by vision of inclusivity and resilience.

Conclusion. The study highlighted the crucial role of artificial intelligence and digital transformation in strengthening sustainable development in the economic, governance, and service sectors, with a particular focus on Ukraine's digital progress. Combining quantitative methods, case studies, and stakeholder interviews, the paper demonstrated how digital technologies contributed to increased resilience, efficiency, and inclusiveness, advancing notably Sustainable Development Goals related to economic growth, innovation, and governance.

The analysis showed that AI-based tools significantly improved economic forecasting, enabling optimised resource allocation and strategic planning. Case studies in the telecommunications sector revealed a marked acceleration in customer service through chatbots and predictive analytics, enhancing customer satisfaction and operational efficiency. Similarly, Ukraine's digital governance platform significantly simplified administrative processes, increasing transparency and public trust. Surveys of professionals revealed widespread optimism about artificial intelligence's potential to enhance competitiveness, although a portion of respondents expressed concerns about data protection and ethical issues.

The investigation also identified significant challenges, including unequal access to technology and a shortage of skilled workers, which risked deepening societal inequalities if not addressed. In Ukraine, limited infrastructure and talent outflows hindered IT sector development, despite its considerable potential. The findings underscored the need for strategic measures, such as public-private partnerships and educational reforms, to harness the nation's innovation capacity.

Theoretically, the paper enriched the understanding of digital transformation as a strategic rethinking of societal and organisational models. Practically, it provided recommendations for ethical and inclusive technological progress. The analysis of Ukraine as a resilient economy facing challenges offered a distinctive model for developing nations. Overall, the study emphasised that digital transformation, guided by inclusiveness and sustainability, drove enduring progress in tackling global challenges.

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