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1.2. Responsible Implementation of Artificial Intelligence as a Factor of Digital Transformation of the Ukrainian Economy: European Experience and Prospects for Adaptation

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Digital transformation is one of the key factors of modern socio-economic development, significantly changing the principles of functioning of economic systems, business processes, the labour market, and mechanisms of public regulation. One of the key technologies that determines the pace and directions of these transformations is artificial intelligence (AI). Due to its ability to automate complex processes, analyse large amounts of data, support management decision-making, and

create new digital products and services, artificial intelligence technologies are becoming an important driver of innovation and increasing the competitiveness of national economies. At the same time, the rapid spread of AI creates new challenges related to algorithm transparency, protection of fundamental human rights, information security, non-discrimination, responsibility for decisions made, and the development of public trust in digital technologies (Floridi, 2023; OECD, 2024).

For Ukraine, the issue of responsible implementation of artificial intelligence is particularly important in the context of the digital transformation of the economy, post-war recovery, and deeper European integration. Obtaining candidate status for membership in the European Union, harmonisation of national legislation with European standards, development of the digital economy, and implementation of strategic documents in the field of digitalization create the need to adapt modern approaches to the use of AI in accordance with the principles established in European digital policy. In this context, not only the technological implementation of intelligent systems is important, but also the development of an institutional, regulatory, and ethical environment that ensures their safe, transparent, and human-centred use.

In recent years, the European Union has developed a comprehensive approach to the regulation and development of artificial intelligence technologies based on a combination of innovation and responsibility. The adoption of the Artificial Intelligence Act, the implementation of the Digital Europe Programme and the Digital Decade 2030 policy, the European Declaration on Digital Rights and Principles, as well as recommendations of the OECD, UNESCO, and NIST have created the basis for the modern concept of Responsible AI. This concept includes risk management, transparency, accountability, fairness, safety, and respect for human rights in the development and use of artificial intelligence systems. For Ukraine, this experience has significant practical value; however, its effective use requires adaptation to national economic, institutional, and social conditions.

The issues of digital transformation, the development of artificial intelligence technologies, and their legal and ethical regulation are actively studied by both Ukrainian and foreign researchers. L. Floridi, J. Cowls, A. Jobin, M. Coeckelbergh, J. Morley, P. Hacker, and other researchers have made significant contributions to the

development of the concept of responsible artificial intelligence. Important methodological guidelines are also provided by documents of the European Commission, OECD, UNESCO, NIST, the United Nations, and other international institutions, which define modern approaches to the development of the digital economy and the responsible use of AI.

At the same time, an analysis of current scientific studies shows that most research focuses on specific aspects of artificial intelligence use, including regulatory and legal frameworks, ethical principles, risk management, technical characteristics of AI systems, or sector-specific features of their application. At the same time, the comprehensive adaptation of the European experience of responsible artificial intelligence implementation to the conditions of the digital transformation of the Ukrainian economy remains insufficiently developed. Approaches to integrating strategic digital development goals, Responsible AI principles, institutional support, implementation tools, and a system for evaluating results within a single conceptual mechanism require further scientific justification.

The aim of the research is to substantiate the theoretical foundations of responsible artificial intelligence implementation as a factor of the digital transformation of the Ukrainian economy, to generalize European experience, and to develop a conceptual mechanism for its adaptation to national development conditions.

In recent years, the issues of digital transformation of the economy and responsible implementation of artificial intelligence have become one of the key areas of interdisciplinary research. The rapid development of artificial intelligence technologies and their active implementation in production processes, services, public administration, and social life have created the need to reconsider traditional approaches to digitalization. Modern research is gradually shifting its focus from analysing the technological capabilities of artificial intelligence to ensuring its safe, transparent, ethical, and human-centred use, which is reflected in the concepts of Trustworthy AI, Ethical AI, and Responsible AI (Floridi, Cowls, 2019; Jobin et al., 2019; Floridi, 2023).

An analysis of current scientific literature makes it possible to identify several interconnected areas of research. The first area focuses on understanding the role of

artificial intelligence as a driving force of the digital transformation of the economy and society. Studies by international organizations emphasize that artificial intelligence technologies are becoming one of the key factors of economic growth, labour productivity, the development of digital markets, and the creation of new models of value creation (OECD, 2024; Stanford University, 2025; World Economic Forum, 2025). At the same time, researchers emphasize that the effectiveness of digital transformation depends not only on the scale of digital technology implementation but also on the level of public trust in these technologies.

The second area covers research into the ethical foundations of artificial intelligence use. Important works in this field include studies by L. Floridi and J. Cowls, which proposed a system of basic principles for the functioning of artificial intelligence, as well as the work of A. Jobin, M. Ienca, and E. Vayena, which summarized international experience in developing ethical recommendations for the use of artificial intelligence technologies (Floridi, Cowls, 2019; Jobin et al., 2019). These ideas were further developed in the works of M. Coeckelbergh (2020), J. Morley et al. (2020), and L. Floridi (2023), which examine mechanisms for the practical implementation of ethical principles in the development and use of artificial intelligence systems.

A separate area of current research is related to the development of the concept of Trustworthy AI and its transformation into the more comprehensive approach of Responsible AI. Scientific literature indicates that responsible implementation of artificial intelligence involves the integration of technological, ethical, legal, and organizational requirements aimed at ensuring the safe use of artificial intelligence systems, minimizing risks, and protecting fundamental human rights (Díaz-Rodríguez et al., 2023; Morley et al., 2020). Thus, current research considers responsible artificial intelligence not as a separate set of ethical principles, but as a comprehensive model of interaction between technology, public regulation, business, and society.

Official documents of the European Union and international organizations play a special role in the development of this field. The starting point for the formation of the modern European model was the document Ethics Guidelines for Trustworthy AI (High-Level Expert Group on AI, 2019), which for the first time systematized the key

requirements for reliable and human-centred artificial intelligence. These provisions were further developed in the OECD AI Principles (OECD, 2024), the Recommendation on the Ethics of Artificial Intelligence (UNESCO, 2021), the Artificial Intelligence Risk Management Framework (NIST, 2023), and the Artificial Intelligence Act (European Parliament and the Council, 2024). This demonstrates the evolution from ethical recommendations to comprehensive legal regulation of artificial intelligence use.

In Ukraine, the development and regulation of artificial intelligence are currently at an active stage of formation. The main strategic documents include the Concept of Development of Artificial Intelligence in Ukraine (Cabinet of Ministers of Ukraine, 2020) and the White Paper on Artificial Intelligence Regulation in Ukraine (Ministry of Digital Transformation of Ukraine, 2024). These documents define the key areas of national policy in the field of artificial intelligence and focus on the gradual harmonization of this policy with European approaches.

At the same time, an analysis of current scientific literature shows that the majority of studies focus on particular aspects of artificial intelligence development, such as ethical principles, legal regulation, risk management, or digital transformation. However, the responsible implementation of artificial intelligence specifically as a factor of the digital transformation of the Ukrainian economy, in the context of adapting the modern European model of AI regulation and development, remains insufficiently studied. This scientific gap determines the relevance and logic of further research.

Digital transformation is one of the key processes in the development of the modern economy. It involves profound changes in the ways value is created, business processes are organized, public institutions operate, and economic actors interact. Unlike digitalization, which primarily involves converting information and individual processes into digital form, digital transformation is characterized by a comprehensive rethinking of economic models based on the widespread use of digital technologies, data, and innovative approaches (European Commission, 2021; OECD, 2024).

The initial stage of the development of the digital transformation concept was mainly associated with the automation of production and management processes, the

development of information and communication technologies, and the implementation of electronic services. During this period, digital technologies were primarily considered as a tool for improving the efficiency of enterprises and public institutions. However, the rapid development of cloud computing, big data, the Internet of Things, and artificial intelligence significantly expanded the meaning of digital transformation, turning it into a systemic process of structural modernization of the economy and society (European Commission, 2021; United Nations, 2024).

At the current stage, artificial intelligence is increasingly recognized as a key technology of digital transformation. Its use enables the automation of decision-making, intelligent analysis of large amounts of data, forecasting of economic processes, optimization of production, development of personalized digital services, and creation of new business models. According to international experts, the widespread implementation of artificial intelligence technologies is one of the main factors contributing to higher labour productivity, innovation activity, and global competitiveness of economies (Stanford University, 2025; World Economic Forum, 2025).

At the same time, accumulated practical experience in the use of artificial intelligence systems has shown that digital transformation cannot be assessed only by the pace of technological development or the scale of automation. The spread of algorithmic decision-making, generative artificial intelligence models, and digital platforms has increased the importance of algorithm transparency, personal data protection, information security, non-discrimination, responsibility for the results of intelligent systems, and public trust in new technologies (Floridi, 2023; Hacker, 2023).

Therefore, the modern understanding of digital transformation is gradually moving beyond the technological approach. Strategic documents of the European Union emphasize that digital development should be human-centred, inclusive, secure, and based on the protection of fundamental human rights (European Commission, 2023; European Commission, 2021). This approach means a transition from the concept of technological digitalization to a model of responsible digital transformation, in which the effectiveness of digital technology implementation is determined not only

by its innovative potential but also by the level of public trust, transparency, and compliance with ethical and legal standards.

In this context, artificial intelligence should be considered not only as a tool of digital transformation but also as a technology whose socio-economic impact directly depends on the model of its implementation. This circumstance has led to the development of new conceptual approaches – Ethical AI, Trustworthy AI, Human-Centric AI, and Responsible AI – which define modern guidelines for the development of the digital economy and have become the basis of European policy in the field of artificial intelligence.

The evolution of the concept of digital transformation of the economy in the context of the development of artificial intelligence technologies is presented in Figure 1.7.

Thus, the evolution of the concept of digital transformation demonstrates a shift in its main focus: from the automation of individual processes and the digitization of information to the comprehensive transformation of economic systems, in which artificial intelligence plays a key role. At the same time, the current stage of development of the digital economy shows that achieving sustainable socio-economic outcomes depends not only on the level of technological development but also on the ability to ensure the responsible implementation of innovations based on the principles of human-centeredness, transparency, safety, and trust.

The rapid spread of artificial intelligence technologies across all areas of economic activity has created not only new opportunities for digital transformation but has also highlighted a range of ethical, social, legal, and technological challenges. While at the early stages of its development artificial intelligence was mainly considered a tool for automating and improving the efficiency of economic processes, the growing autonomy of intelligent systems has led the academic community to pay increasing attention to issues of responsibility for the results of their operation, algorithmic transparency, non-discrimination, protection of human rights, and building trust in digital technologies (Floridi, 2023; Hacker, 2023).

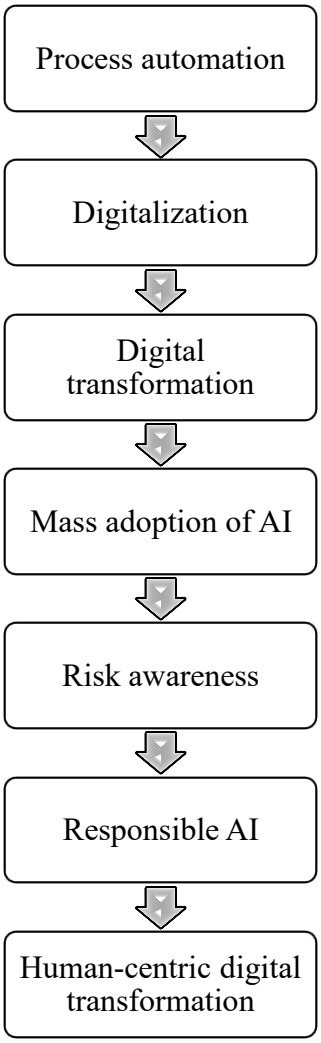


Fig. 1.7. Evolution of the Concept of Digital Transformation of the Economy in the Context of the Development of Artificial Intelligence Technologies

Source: compiled by the authors based on High-Level Expert Group on AI (2019); UNESCO (2021); European Commission (2021, 2023, 2024); OECD (2024).

The evolution of scientific approaches to the use of artificial intelligence demonstrates a gradual shift from a narrow technological perspective to a comprehensive understanding of its role in socio-economic development. One of the first systematic approaches was the concept of "Ethical AI", which focuses on the moral principles underlying the development and use of artificial intelligence systems. Its formation is based on widely recognized ethical principles, including respect for human rights, fairness, non-discrimination, prevention of harm, accountability, and transparency (Floridi, Cowls, 2019). A review of the international experience in developing ethical guidelines conducted by A. Jobin, M. Ienca, and E. Vayena showed

that, regardless of national characteristics, most ethical documents are based on similar fundamental values, although the mechanisms for their practical implementation differ significantly (Jobin et al., 2019).

The further development of conceptual approaches led to the formation of the "Trustworthy AI" model, which combines ethical principles with requirements for the functioning of artificial intelligence systems. The document "Ethics Guidelines for Trustworthy AI", prepared by the High-Level Expert Group on AI at the European Commission, played a key role in its development (High-Level Expert Group on AI, 2019). It proposed a comprehensive approach to assessing the trustworthiness of artificial intelligence, based on the principles of lawfulness, ethics, and technical robustness of AI systems. It also identified seven key requirements, including human agency and oversight, technical robustness and safety, privacy and data governance, transparency, diversity and non-discrimination, societal and environmental well-being, and accountability.

Further development of digital technologies demonstrated that ensuring trustworthiness characteristics alone is not sufficient for the effective use of artificial intelligence in the economy. This contributed to the development of the broader concept of "Responsible AI", which shifts the focus from the characteristics of an individual technology to the entire life cycle of AI systems – from the design and training of models to their deployment, operation, monitoring, and assessment of their socio-economic impacts. In current research, responsible artificial intelligence is considered as an integration of ethical principles, legal requirements, risk-management mechanisms, and organizational practices that ensure the safe and socially acceptable use of intelligent systems (Morley et al., 2020; Díaz-Rodríguez et al., 2023).

An important stage in the development of the responsible artificial intelligence concept was its establishment in international regulatory and policy documents. The UNESCO "Recommendation on the Ethics of Artificial Intelligence" defined global principles for the development and use of AI, focused on the protection of human rights, inclusiveness, and sustainable development (UNESCO, 2021). The OECD principles specified the need to combine innovation and development with accountability, transparency, and risk management (OECD, 2024). Practical risk-

management mechanisms were proposed in the NIST framework (NIST, 2023), while the adoption of the "Artificial Intelligence Act" represented a logical transition from non-binding recommendations to a comprehensive legal framework for regulating artificial intelligence in the European Union (European Parliament and the Council, 2024).

Thus, the modern understanding of Responsible AI has emerged as a result of the gradual evolution of scientific concepts and international regulatory practice. While the Ethical AI concept defines a system of fundamental values, Trustworthy AI establishes requirements for the characteristics of intelligent systems, and Responsible AI covers the entire process of their development, deployment, and use, integrating ethical, legal, organizational, and technological dimensions. It is precisely this comprehensive approach that currently defines the strategic directions of digital transformation of the economy in the countries of the European Union.

A comparative analysis of modern concepts of the responsible development and implementation of artificial intelligence is presented in Table 1.3.

Table 1.3

Comparative Characteristics of Modern Concepts of the Responsible Development and Implementation of Artificial Intelligence

Concept	**Main Focus**	**Key Characteristics**	**Role in Responsible AI Implementation**
Ethical AI	Ethical values	Fairness, human rights, non-discrimination	Establishes a system of ethical principles
Trustworthy AI	System properties	Transparency, safety, accountability, human oversight	Builds trust in AI systems
Human-Centric AI	Human-centered approach	Priority given to human rights, freedoms, and well-being	Directs AI development towards human needs
Responsible AI	Comprehensive model	Ethical, legal, organizational, and technological mechanisms	Ensures comprehensive responsible implementation of AI in economic and social processes

Source: compiled by the authors based on Floridi, Cowls, 2019; Jobin et al., 2019; High-Level Expert Group on AI, 2019; Morley et al., 2020; Díaz-Rodríguez et al., 2023; OECD, 2024.

The analysis provides grounds for arguing that the concepts of Ethical AI, Trustworthy AI, and Responsible AI are not identical but reflect different stages in the evolution of scientific understanding of the role of artificial intelligence in society and the economy. Their relationship lies in the gradual expansion of their scope: from defining ethical principles to developing a comprehensive model for the responsible implementation and use of artificial intelligence. In this context, Responsible AI can be considered an integral concept that combines ethical values, requirements for system trustworthiness, risk-management mechanisms, and regulatory and legal frameworks, ensuring a balanced combination of innovative development, protection of human rights, and public trust.

The current stage of digital transformation of the economy is characterized not only by the widespread use of digital technologies but also by a significant increase in the role of artificial intelligence as a general-purpose technology capable of changing mechanisms of value creation, the organization of production processes, resource management, and interaction between economic actors. The use of artificial intelligence systems creates new opportunities for automation, intelligent data analysis, forecasting, service personalization, and the development of innovative business models, contributing to higher labor productivity, enterprise competitiveness, and the development of the digital economy (OECD, 2024; Stanford University, 2025).

At the same time, international experience shows that the positive impact of artificial intelligence on economic development is not an automatic consequence of its technological implementation. The use of algorithmic systems without due consideration of ethical, legal, and social aspects may increase the risks of discrimination, violations of the right to privacy, lack of transparency in decision-making processes, declining public trust in digital technologies, and greater regulatory uncertainty (UNESCO, 2021; NIST, 2023; European Parliament and the Council, 2024).

Therefore, the modern European model of digital transformation is based on the understanding that innovation and responsibility are not mutually exclusive categories. On the contrary, the responsible implementation of artificial intelligence is considered a necessary prerequisite for sustainable economic development, as it contributes to

building trust in digital technologies, reducing the risks associated with their use, and creating a predictable regulatory environment for innovation (European Commission, 2023; OECD, 2024).

In this context, the responsible implementation of artificial intelligence should be considered as a comprehensive process covering all stages of the life cycle of intelligent systems – from design and model training to integration, operation, monitoring, and improvement. This approach involves adherence to the principles of human-centeredness, transparency, safety, accountability, fairness, and risk management, ensuring a balance between technological innovation, economic efficiency, and public interests (High-Level Expert Group on AI, 2019; Morley et al., 2020; Díaz-Rodríguez et al., 2023).

From the perspective of economics, the responsible implementation of artificial intelligence creates the conditions for sustainable competitive advantages. A high level of trust in digital technologies encourages their wider use by businesses and consumers, reduces transaction costs associated with controlling and mitigating risks, increases the investment attractiveness of digital innovations, and contributes to the development of new markets for digital products and services. Thus, the economic effect of using artificial intelligence is determined not only by its functional capabilities but also by the quality of the institutional environment in which it is implemented.

For Ukraine, these issues are particularly relevant in the context of European integration, digital modernization of the economy, and post-war recovery. Adapting European principles of responsible AI use should contribute not only to harmonizing national legislation with European Union law but also to developing a modern digital innovation ecosystem focused on increasing economic competitiveness, supporting entrepreneurship, attracting investment, and strengthening trust in digital services.

Summarizing the results of the analysis, it can be argued that under current conditions of digital transformation, the decisive factor in achieving long-term socio-economic effects is not the mere use of artificial intelligence technologies but the model of their implementation. Responsible implementation, which combines innovation with adherence to ethical principles, legal requirements, risk-management mechanisms, and the protection of human rights, builds trust in digital technologies,

creates conditions for their widespread use in the economy, and increases the effectiveness of digital transformation.

Based on the analysis, we propose considering the responsible implementation of artificial intelligence as a comprehensive mechanism for ensuring the digital transformation of the economy that integrates technological, ethical, legal, organizational, and institutional components. Unlike approaches in which artificial intelligence is viewed primarily as a technological resource, the proposed approach emphasizes that the quality of its implementation determines the level of public trust, the scale of practical use, and the final economic outcomes of digital transformation.

In this regard, we propose the following original definition: "Responsible implementation of artificial intelligence is a comprehensive process of developing, integrating, using, and monitoring artificial intelligence systems, carried out on the basis of human-centeredness, ethical principles, transparency, safety, accountability, and risk management, ensuring respect for fundamental human rights, building public trust in digital technologies, and creating conditions for sustainable development and increased economic competitiveness."

The European Union was among the first in the world to develop a comprehensive approach to the regulation and implementation of artificial intelligence that combines support for innovation with the protection of fundamental human rights, the safety of digital technologies, and the development of trust in their use. Unlike models focused primarily on stimulating technological development or minimizing government intervention, the European approach is based on the integration of ethical, legal, technological, and economic mechanisms that ensure the responsible use of artificial intelligence systems (European Commission, 2023; OECD, 2024). The modern European model of responsible AI implementation was developed gradually (Table 1.4).

The first stage involved defining the basic ethical principles for the use of artificial intelligence. In 2019, the High-Level Expert Group on AI published the document Ethics Guidelines for Trustworthy AI, which established the conceptual foundation for subsequent European Union policy. The proposed principles of human-centeredness, transparency, technical robustness, accountability, fairness, and non-

discrimination became the foundation for the development of subsequent regulatory and strategic documents (High-Level Expert Group on AI, 2019).

Table 1.4.

Evolution of the European Model of Responsible Artificial Intelligence Implementation

Stage	Key Document	Main Outcome
Ethical	Ethics Guidelines for Trustworthy AI	Development of responsible AI principles
Strategic	Digital Europe Programme, Digital Decade Policy Programme 2030	Definition of strategic development priorities
International and Practical	OECD AI Principles, UNESCO Recommendation, NIST AI RMF	Development of universal approaches and tools for Responsible AI
Regulatory	Artificial Intelligence Act	Establishment of a comprehensive legal framework

Source: compiled by the authors based on an analysis of regulatory and strategic documents of the EU and international organizations.

The further development of the European approach was associated with a transition from ethical recommendations to the formation of a comprehensive digital transformation policy. The Shaping Europe's Digital Future strategy and the Digital Europe and Digital Decade 2030 programmes identified artificial intelligence as one of the key tools for increasing the competitiveness of the European economy, developing digital skills, strengthening the innovation ecosystem, and expanding digital infrastructure. At the same time, these documents emphasize that economic development should be pursued in compliance with the principles of safety, inclusiveness, human-centeredness, and the protection of fundamental rights (European Commission, 2021; European Commission, 2023).

The next stage involved the development of practical mechanisms for ensuring the responsible use of artificial intelligence. The OECD Principles and the UNESCO Recommendation contributed to the harmonization of international approaches to AI

ethics, while the NIST AI Risk Management Framework provided tools for identifying, assessing, and mitigating risks throughout the life cycle of artificial intelligence systems. Thus, the European model gradually evolved from the normative definition of values to the creation of practical mechanisms for their implementation (UNESCO, 2021; NIST, 2023; OECD, 2024).

The logical culmination of this process was the adoption of the Artificial Intelligence Act, which, for the first time in international practice, introduced a comprehensive legal framework for artificial intelligence based on a risk-based approach. The Act establishes different requirements for AI systems depending on the level of potential risk, combining the protection of human rights with support for innovation. This approach creates a predictable regulatory environment for the development of the digital economy and contributes to increasing business and public trust in the use of artificial intelligence technologies (European Parliament and the Council, 2024).

Thus, the modern European model of responsible AI implementation is the result of the gradual integration of ethical principles, strategic digital development priorities, risk-management tools, and legal regulatory mechanisms. Its distinctive feature is its focus not only on technological progress but also on creating conditions for sustainable economic development, strengthening trust in digital technologies, and ensuring their social acceptance.

The development of the European model of responsible AI implementation is not limited to defining ethical principles or adopting regulatory acts. Its effectiveness is largely ensured by a system of interconnected instruments covering legal, institutional, organizational, financial, and technological mechanisms (Fig. 1.8). Their comprehensive application creates conditions for the balanced development of innovation, risk minimization, and the formation of trust in digital technologies.

A key element of the legal framework of the European model is the Artificial Intelligence Act, which introduces a risk-based approach to the regulation of artificial intelligence systems. Unlike traditional technology regulation, the Act classifies AI systems according to their level of potential risk and establishes differentiated requirements for their development, deployment, and use. This approach makes it

possible to protect human rights while avoiding unnecessary restrictions on innovation, thereby creating a predictable legal environment for businesses (Regulation (EU) 2024/1689, 2024).

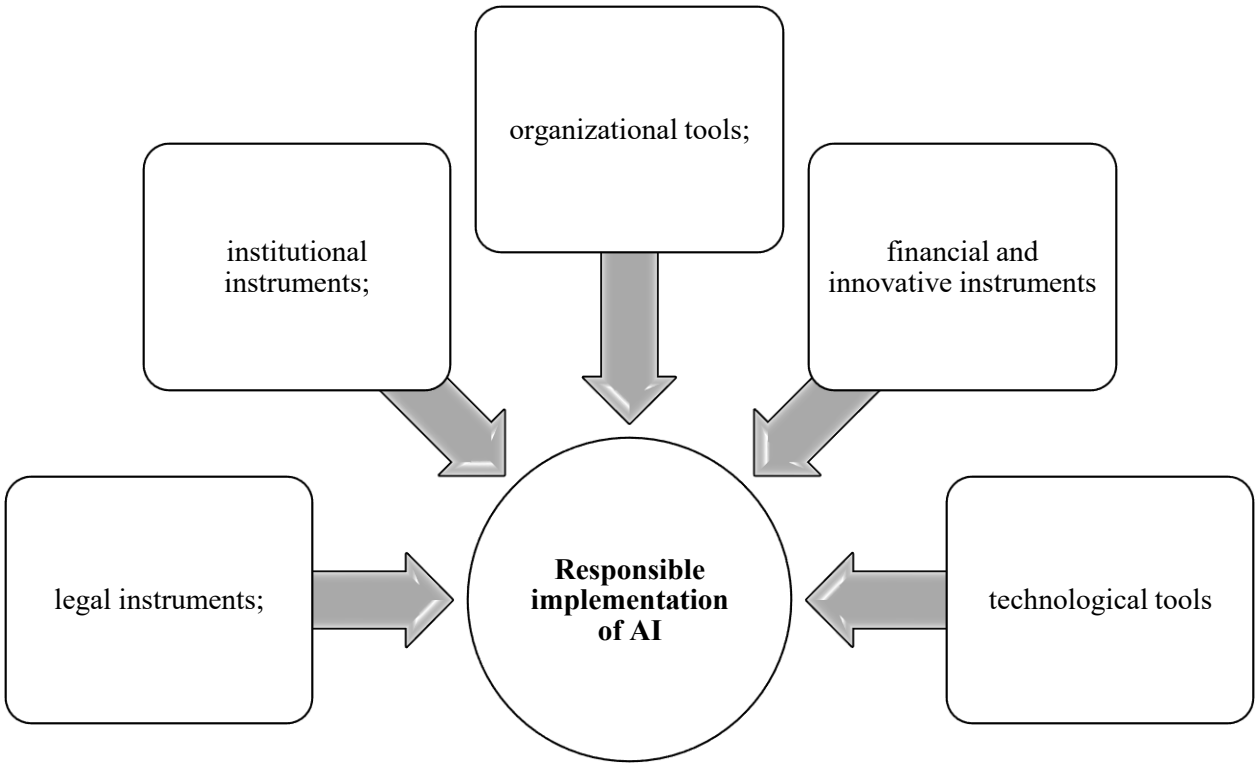


Fig. 1.8. System of instruments for ensuring the responsible implementation of artificial intelligence in the European model of digital transformation
Source: developed by the authors based on Regulation (EU) 2024/1689, 2024; Novelli et al., 2024; NIST, 2023; Morley et al., 2020; European Commission, 2021.

An important component of the European model is the creation of an institutional system for coordinating and overseeing the implementation of artificial intelligence. The AI Act provides for the operation of the AI Office, European Artificial Intelligence Board, and national competent authorities, which ensure consistency in the application of the legislation, coordination among Member States, exchange of experience, and monitoring of technological developments (Novelli et al., 2024). The establishment of such institutions contributes to greater effectiveness of public policy in the field of artificial intelligence and ensures the stability of the regulatory environment.

The European model provides for organizational mechanisms aimed at managing risks throughout the entire life cycle of artificial intelligence systems. These include conformity assessment, documentation of development processes, ensuring human oversight, internal audits, monitoring the operation of systems after their deployment, and mechanisms for responding to identified risks. Particular attention is paid to establishing internal risk-management procedures at the organizational level, which is consistent with current approaches to the corporate governance of digital innovations (NIST, 2023; Morley et al., 2020).

Alongside regulatory mechanisms, the European Union actively uses financial instruments to stimulate digital transformation. The Digital Europe Programme and Horizon Europe are aimed at developing digital infrastructure, supporting scientific research, creating innovation ecosystems, developing digital competencies, and implementing artificial intelligence technologies across various sectors of the economy. European Digital Innovation Hubs also play an important role by providing enterprises, particularly small and medium-sized enterprises, with access to expert support, digital solution testing, and advanced technological infrastructure (European Commission, 2021).

Another area involves technological mechanisms for ensuring the responsible use of artificial intelligence. These include standardization, testing systems before their widespread deployment, the use of AI regulatory sandboxes, data quality assessment, ensuring cybersecurity, and continuous monitoring of algorithm performance. Such tools make it possible to identify potential risks at an early stage, improve the trustworthiness of artificial intelligence systems, and create conditions for the safe implementation of innovation (Regulation (EU) 2024/1689, 2024; NIST, 2023).

The analysis shows that the effectiveness of the European model is ensured not by individual instruments but by their interaction.

Legal mechanisms create a predictable regulatory environment; institutional mechanisms ensure coordination and oversight; organizational mechanisms integrate the principles of responsible AI use into the practices of organizations; financial mechanisms stimulate innovation activity; and technological mechanisms support the safe implementation of digital solutions.

The combination of these instruments creates conditions for increasing trust in digital technologies, reducing transaction costs, increasing the investment attractiveness of digital projects, and strengthening the competitiveness of the economy (Table 1.5).

Table 1.5

Економічне значення інструментів відповідального впровадження ШІ

Instrument	Main Purpose	Expected Economic Effect
Legal	Reduction of regulatory uncertainty	Increased investment attractiveness
Institutional	Coordination and oversight	Improved consistency of digital transformation processes
Organizational	Risk management and process control	Reduced losses and increased efficiency of business processes
Financial and innovation-related	Support for innovation	Accelerated digital transformation of businesses
Technological	Ensuring system trustworthiness	Increased trust in digital solutions

Source: compiled by the authors based on Regulation (EU) 2024/1689; OECD, 2024; NIST, 2023; UNESCO, 2021.

The analysis allows us to conclude that a distinctive feature of the European model of responsible AI implementation is its comprehensive nature.

Unlike approaches that focus primarily on regulatory frameworks or ethical aspects, the European model integrates legal, institutional, organizational, financial, and technological instruments into a unified system. Their interaction ensures not only an appropriate level of safety and trust in artificial intelligence technologies but also creates favorable conditions for innovation and the digital transformation of the economy.

The analysis shows that the European model of responsible AI implementation has developed in conditions of a high level of digital maturity of the economy, a developed institutional environment, stable regulatory and legal frameworks, and significant investment in digital innovation. Therefore, its use in Ukraine cannot be limited to the mechanical adoption of individual regulatory acts or organizational solutions. Much greater attention should be paid to adapting the conceptual foundations of the European approach to Ukraine's national socio-economic conditions, digital development priorities, and European integration course.

Ukraine has already taken a number of important steps towards developing public policy in the field of artificial intelligence. The adoption of the Concept for the Development of Artificial Intelligence in Ukraine and the White Paper on the Regulation of Artificial Intelligence demonstrates an intention to harmonize the national approach with contemporary European principles. At the same time, these documents are primarily strategic in nature and define general development directions, while practical mechanisms for responsible AI implementation are still at the stage of development.

Unlike the European Union, where the Responsible AI model is supported by a developed system of institutions, financial instruments, and risk-assessment mechanisms, digital transformation in Ukraine is taking place under conditions of wartime challenges, the need for post-war economic recovery, limited financial resources, and simultaneous large-scale institutional reforms. Therefore, the priority should not be the complete replication of the European model but the identification of those of its elements that can generate the greatest economic effect in the medium term.

In our view, the priority areas for adapting European experience include the development of a transparent regulatory environment, strengthening institutional capacity in the field of artificial intelligence, integrating risk-management mechanisms into organizational practices, supporting research and innovation, and developing digital competencies. An important factor in successful adaptation is ensuring cooperation among the state, business, the academic community, and civil society, which is consistent with contemporary principles of multi-stakeholder governance of digital transformation.

The economic dimension of responsible AI implementation is of particular importance. Establishing clear rules for the use of intelligent systems, supporting innovation, and increasing trust in digital technologies may contribute to greater investment activity, the development of high-tech entrepreneurship, higher labor productivity, and the integration of Ukrainian companies into the European digital market. In this context, responsible AI implementation should be considered not only as an element of public policy but also as a tool for increasing the competitiveness of the national economy.

Thus, the practical value of European experience for Ukraine lies not in the possibility of directly copying individual regulatory or organizational solutions but in applying a systemic approach to AI development. The comprehensive combination of legal, institutional, organizational, financial, and technological instruments can create trust in digital innovations, establish a favorable environment for their widespread adoption, and increase the effectiveness of digital transformation of the Ukrainian economy.

The analysis leads to the conclusion that adapting European experience should be based not on the principle of "copying regulatory solutions" but on the principle of "adapting a systemic model." Such an approach involves taking into account the specific features of Ukraine's institutional development, the economic challenges of the wartime and post-war periods, and the strategic objectives of European integration. Under these conditions, responsible AI implementation can become one of the factors contributing to the innovation capacity, competitiveness, and resilience of the national economy.

To further specify the proposed conceptual mechanism, it is appropriate to identify the key areas for adapting the European experience of responsible AI implementation to the current conditions of digital transformation of the Ukrainian economy. Such a systematization makes it possible to assess the current state of individual components, determine their development priorities, and outline the expected results of implementing the relevant measures (Table 1.6).

The presented matrix demonstrates that adapting European experience is not limited to the implementation of individual regulatory acts or technological solutions.

Table 1.6.

Matrix for Adapting the European Experience of Responsible Artificial Intelligence Implementation to the Conditions of Digital Transformation of the Ukrainian Economy

Element of the European Model	Current State in Ukraine	Adaptation Priority	Expected Effect
Regulatory Framework	Under development	High	Predictability of the regulatory environment
Institutional System	Partially established	High	Increased effectiveness of public policy
Risk Management	Fragmentary application	High	Reduction of technological and reputational risks
Innovation Support	Developing	Medium	Accelerated digital modernization
Digital Competencies	Require further development	High	Increased labor productivity
Trust in AI	At the development stage	High	Wider adoption of digital technologies

Source: developed by the authors based on an analysis of European Commission, 2024; OECD, 2024; UNESCO, 2021; NIST, 2023.

It involves the comprehensive development of the institutional environment, the risk-management system, human capital, the innovation ecosystem, and mechanisms for building trust in artificial intelligence technologies. The coordinated development

of these components ensures the practical implementation of the proposed conceptual mechanism and creates the conditions for effective digital transformation of the Ukrainian economy.

The results of the analysis show that the European model of responsible AI implementation has developed as an integrated system that combines ethical principles, regulatory and legal frameworks, institutional support, risk-management mechanisms, and instruments for supporting innovation. At the same time, its effectiveness is largely determined by the specific socio-economic conditions of the Member States of the European Union, the level of development of the digital economy, and the institutional capacity of public authorities. This necessitates the adaptation rather than the mechanical transfer of European approaches to Ukraine's national practice.

For Ukraine, responsible AI implementation is particularly relevant in the context of simultaneous digital transformation, pursuit of European integration, and post-war economic recovery. The use of artificial intelligence technologies is gradually expanding in public administration, the financial sector, industry, logistics, healthcare, agriculture, and other areas of economic activity. Alongside new opportunities, there is a growing need to ensure algorithmic transparency, manage risks, protect data, develop digital competencies, and build trust in intelligent systems (Cabinet of Ministers of Ukraine, 2020; Ministry of Digital Transformation of Ukraine, 2024).

An important prerequisite for adaptation is also the harmonization of Ukrainian legislation with European Union law. Granting Ukraine candidate status for EU membership has increased the need for the gradual alignment of the national regulatory environment with European approaches, particularly in the areas of the digital economy and the use of artificial intelligence. At the same time, adaptation should not be reduced to the formal implementation of individual provisions of the AI Act. It is more appropriate to adopt the systemic logic of the European model, which provides for the coordinated functioning of legal, institutional, organizational, financial, and technological instruments.

In our view, the systemic nature of adaptation should determine the further development of public policy in the field of artificial intelligence. Under current conditions, it is important not only to establish an appropriate regulatory framework

but also to develop a mechanism that ensures the practical implementation of the principles of responsible AI implementation in economic activity. Such a mechanism should be aimed at supporting innovation, minimizing risks, increasing trust in digital technologies, and strengthening the competitiveness of the economy.

The synthesis of the results of the first and second sections provides grounds for arguing that the mechanism for adapting the European model should be considered as an interconnected system of elements whose functioning ensures the integration of the principles of responsible AI use into the processes of digital transformation of the Ukrainian economy. Its development should be based on a comprehensive approach that takes into account both international experience and national specificities of socio-economic development.

nlike approaches focused primarily on harmonizing the regulatory and legal framework, the proposed approach considers the adaptation of the European model as a multi-component mechanism in which legal provisions are only one of several interconnected elements. Institutional capacity, the development of digital competencies, innovation support, risk management, and the formation of public trust in artificial intelligence technologies are also of critical importance. It is their comprehensive interaction that creates the conditions for effective digital transformation of the Ukrainian economy.

The analysis of theoretical approaches, international recommendations, and the practice of AI regulation in the countries of the European Union has demonstrated that the effective use of artificial intelligence technologies requires not only an appropriate regulatory and legal framework but also a comprehensive system of interconnected elements that ensure their practical implementation. Therefore, the adaptation of European experience to the conditions of Ukraine should be considered as an integrated mechanism that combines strategic objectives, principles, stakeholders, instruments, and implementation processes for responsible AI implementation. The conceptual model of the proposed mechanism is presented in Figure 1.9.

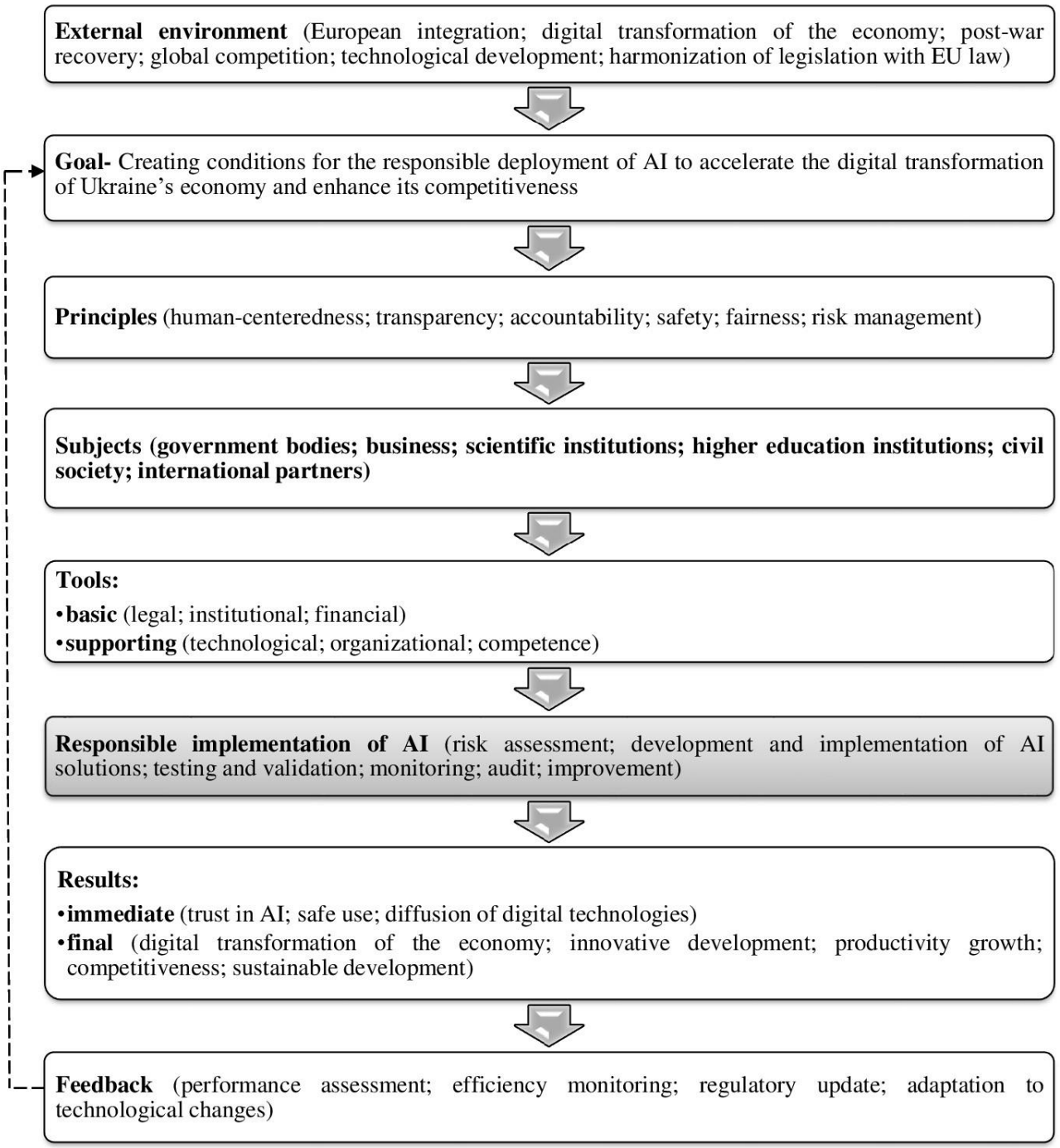


Fig. 1.9. Conceptual Model of the Mechanism for Adapting the European Experience of Responsible Artificial Intelligence Implementation to the Conditions of Digital Transformation of the Ukrainian Economy

Source: developed by the authors based on a synthesis of European approaches to responsible artificial intelligence implementation (AI Act, OECD AI Principles, UNESCO Recommendation on the Ethics of Artificial Intelligence, NIST AI RMF, etc.).

In our view, the mechanism for adapting the European experience of responsible artificial intelligence implementation represents an interconnected set of legal, institutional, organizational, financial, technological, and competency-based instruments. Their implementation ensures the integration of Responsible AI principles into the process of digital transformation of the Ukrainian economy, taking into account national development specificities, current challenges, and the strategic priorities of European integration.

The proposed model is based on a systemic approach, according to which the functioning of the mechanism is determined by the influence of the external environment, which includes the processes of European integration, digital transformation of the economy, post-war recovery of Ukraine, technological development, global competition, and harmonization of national legislation with European Union law. The combination of these factors creates the prerequisites for the implementation of modern digital technologies and determines public policy priorities in the field of artificial intelligence.

The purpose of the mechanism is to create conditions for the responsible implementation of artificial intelligence as one of the key factors of digital transformation of the Ukrainian economy and to increase its competitiveness. This goal is achieved through the implementation of a set of principles consistent with modern international approaches to Responsible AI, including human-centeredness, transparency, accountability, fairness, safety, and a risk-based approach.

An important place in the proposed model is occupied by the stakeholders involved in implementing the mechanism. Their interaction ensures the comprehensive nature of adapting European experience and creates conditions for the coordinated development of the digital economy. Key stakeholders include public authorities, business entities, research institutions, higher education institutions, civil society, and international partners.

The practical implementation of the mechanism is carried out through a system of interconnected instruments. Legal instruments ensure the development of a

regulatory environment for the use of artificial intelligence; institutional instruments support the development of the organizational capacity of relevant authorities and institutions; financial instruments stimulate innovation activity; organizational instruments coordinate interaction among participants in the process; technological instruments support the development of digital infrastructure and the practical use of AI solutions; and competency-based instruments contribute to the development of digital competencies and a culture of responsible AI use.

The central element of the model is the process of responsible AI implementation, which covers risk assessment, development, testing, practical deployment, monitoring, auditing, and continuous improvement of intelligent systems. This process ensures the transformation of regulatory principles and strategic decisions into actual economic outcomes.

The functioning of the mechanism is aimed at achieving two interconnected groups of results. Immediate results include increased trust in artificial intelligence technologies, ensuring their safe use, and the wider adoption of AI solutions across various sectors of the economy. The ultimate results include accelerated digital transformation of the economy, development of innovation activity, increased labor productivity, strengthened competitiveness of the national economy, and sustainable development.

The proposed model has a cyclical nature. Through the feedback system, the results of implementing the mechanism are continuously assessed, making it possible to improve the regulatory and legal framework, adapt instruments to technological changes, and ensure the continuous development of the responsible AI implementation system.

The characteristics of the structural elements of the conceptual model of the mechanism for adapting the European experience of responsible artificial intelligence implementation to the conditions of digital transformation of the Ukrainian economy are presented in Table 1.7.

Table 1.7.

Characteristics of the Structural Elements of the Conceptual Model of the Mechanism for Adapting the European Experience of Responsible Artificial Intelligence Implementation to the Conditions of Digital Transformation of the Ukrainian Economy

Structural Element	Content	Function in the Mechanism
External Environment	European integration, digital transformation of the economy, post-war recovery, technological development, global competition, harmonization of legislation	Creates the prerequisites for the functioning of the mechanism and determines its strategic development directions
Purpose	Creating conditions for the responsible implementation of artificial intelligence as a factor of digital transformation of the Ukrainian economy	Directs the activities of all stakeholders towards achieving strategic outcomes
Principles	Human-centeredness, transparency, accountability, fairness, safety, risk-based approach	Define the fundamental principles of the mechanism and ensure compliance with international Responsible AI standards
Stakeholders	Public authorities, business, research institutions, higher education institutions, civil society, international partners	Ensure the development, coordination, and practical implementation of the mechanism
Instruments	Legal, institutional, organizational, financial, technological, and competency-based	Create organizational, regulatory, resource, and human-capital conditions for responsible AI implementation
Responsible Artificial Intelligence Implementation	Risk assessment, design, testing, deployment, monitoring, auditing, and improvement of AI solutions	Ensures the practical implementation of Responsible AI principles in digital transformation processes
Results	Increased trust in AI, safe use of technologies, development of the digital economy, innovation activity, labor productivity, competitiveness	Reflect the socio-economic effects of implementing the mechanism
Feedback	Monitoring, performance evaluation, updating the regulatory framework, improving instruments, adaptation to technological changes	Ensures continuous improvement of the mechanism in response to changes in the external environment

Source: developed by the authors.

The proposed conceptual model reflects the relationship between the strategic objectives of digital transformation of the Ukrainian economy and the instruments for adapting the European experience of responsible artificial intelligence implementation. Unlike approaches that focus primarily on the regulatory and legal aspects of AI regulation, the proposed model integrates the external conditions of its functioning, a system of principles, the stakeholders involved, a set of instruments, the practical implementation process, and a feedback mechanism. This makes it possible to consider responsible AI implementation not as a separate area of digital policy but as a comprehensive mechanism that ensures the alignment of technological development, institutional capacity, and the economic priorities of the state.

The implementation of the proposed mechanism for adapting the European experience of responsible artificial intelligence implementation is aimed at achieving a set of interconnected outcomes covering the institutional, technological, economic, and social dimensions of digital transformation of the Ukrainian economy. Unlike approaches focused primarily on the regulatory and legal aspects of artificial intelligence, the proposed mechanism is aimed at creating an integrated system of interaction among the state, business, the scientific community, and society, thereby creating the conditions for the large-scale and responsible implementation of AI solutions (Fig. 1.10).

The first group consists of immediate results that characterize the changes arising during the implementation of the mechanism. These primarily include the development of a modern regulatory environment harmonized with European approaches to artificial intelligence regulation, strengthening the institutional capacity of public authorities and other stakeholders involved in digital transformation, and expanding practices of responsible use of AI technologies. An important outcome is an increase in the level of digital competencies among employees, managers, researchers, and citizens, which will contribute to the more effective and safe use of intelligent systems in various areas of economic activity (OECD, 2024; UNESCO, 2021).

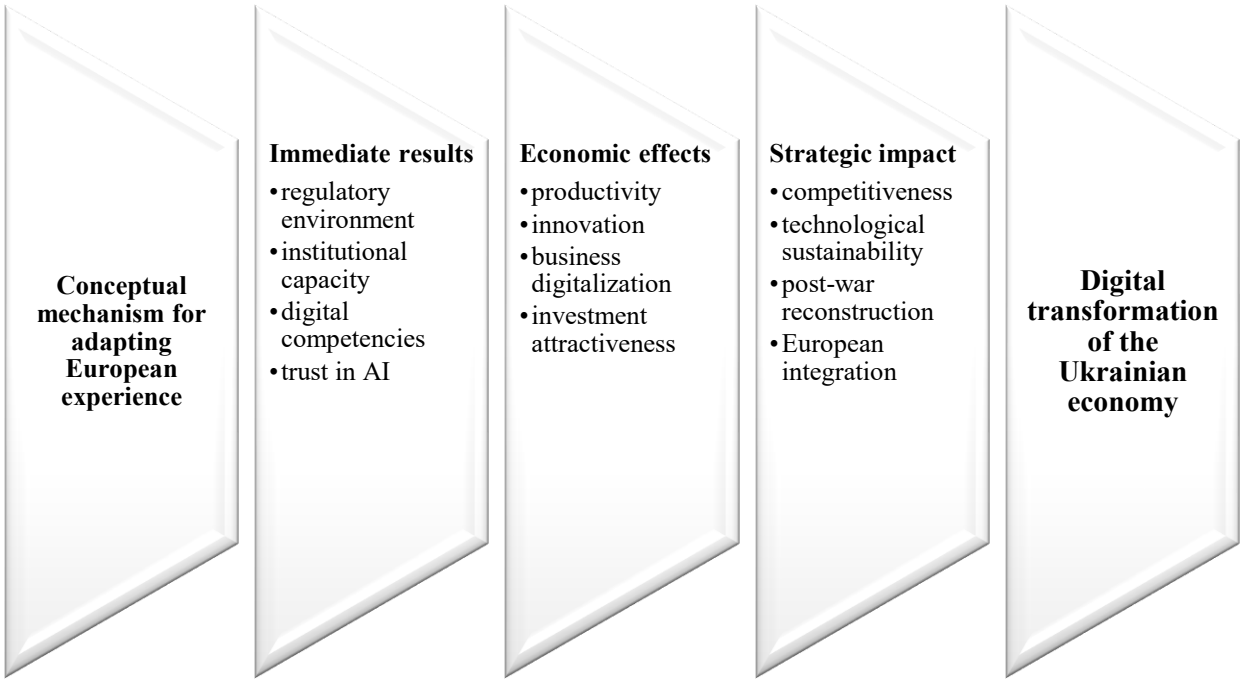


Fig. 1.10. Conceptual Model of the Transformation of Responsible Artificial Intelligence Implementation Outcomes into Strategic Effects of Digital Transformation of the Ukrainian Economy

Source: developed by the author.

Particular importance is attached to increasing public trust in artificial intelligence technologies. International experience shows that user trust, algorithmic transparency, adherence to ethical principles, and effective risk management determine the readiness of businesses and society to adopt innovative digital solutions (Floridi, 2023; OECD, 2024). In this context, responsible AI implementation is not only a technological but also a social prerequisite for digital transformation.

The second group of results is related to the economic effects of implementing the proposed mechanism. The systematic use of artificial intelligence technologies, provided that the principles of Responsible AI are observed, creates conditions for increasing labor productivity, optimizing business processes, reducing transaction costs, accelerating management decision-making, and improving resource efficiency. In addition, the wider adoption of AI solutions will stimulate innovation activity among enterprises, the development of digital entrepreneurship, and the creation of new high-tech jobs, which is consistent with current global trends in the development of the digital economy (Stanford University, 2025; World Economic Forum, 2025).

At the same time, the economic effect of implementing the mechanism is not limited to individual enterprises. At the national economy level, responsible AI implementation will contribute to increasing Ukraine's investment attractiveness, expanding opportunities to participate in European digital initiatives, intensifying international scientific and technological cooperation, and integrating Ukraine into the European Union's Digital Single Market. Taken together, these factors will create additional opportunities for accelerating structural modernization of the economy and developing the innovation ecosystem.

A separate group consists of strategic outcomes that have a long-term nature. They should be considered as the result of the consistent implementation of all elements of the proposed mechanism. These outcomes include increased competitiveness of the national economy, the development of resilient digital infrastructure, strengthened technological capacity of the state, development of human capital, and the creation of conditions for sustainable socio-economic development. These outcomes are particularly important in the context of Ukraine's post-war recovery, when digital technologies can become one of the key instruments for modernizing the economy, improving the efficiency of public administration, developing entrepreneurship, and integrating into the European economic space (European Commission, 2023; United Nations, 2024).

Thus, the proposed mechanism not only ensures the adaptation of the European experience of responsible AI implementation to national conditions but also creates an integrated system of relationships between the strategic objectives of digital transformation, the principles of Responsible AI, the institutional environment, and the expected socio-economic outcomes. Its practical implementation will contribute to a transition from fragmented use of AI technologies to the systemic development of the Ukrainian digital economy based on the principles of safety, transparency, inclusiveness, and innovation.

The study confirmed that, under conditions of rapid digital technology development, responsible AI implementation is of strategic importance as one of the key factors of digital transformation of the Ukrainian economy. Unlike approaches that view artificial intelligence primarily as a technological tool or an object of regulatory

and legal regulation, this article substantiates the need for its comprehensive implementation based on human-centeredness, transparency, safety, accountability, and risk management in accordance with contemporary European and international approaches.

The study established that the modern European model of responsible AI implementation is developing as an integrated system of interconnected legal, institutional, technological, and ethical instruments aimed at ensuring innovative development while simultaneously respecting fundamental human rights, maintaining public trust, and ensuring the safe use of AI technologies. The analysis of European Union regulatory documents, international recommendations, and recent academic research demonstrated that a risk-based approach, the development of digital competencies, cross-sectoral cooperation, and systematic monitoring of effectiveness are key components of successful digital transformation of the economy.

The main result of the study is the development of a conceptual mechanism for adapting the European experience of responsible artificial intelligence implementation to the conditions of digital transformation of the Ukrainian economy. The proposed mechanism combines a strategic objective, the principles of Responsible AI, a set of stakeholders, a comprehensive set of implementation instruments, the process of responsible AI implementation, expected outcomes, and a feedback system. Unlike existing approaches, it focuses not only on adapting individual European practices but also on developing an integrated model for their incorporation, taking into account Ukraine's economic, institutional, and social specificities.

It has been substantiated that the practical implementation of the proposed mechanism will contribute to creating a favorable environment for the responsible use of artificial intelligence, developing digital competencies, increasing the innovation activity of enterprises, strengthening trust in AI solutions, increasing labor productivity, intensifying international scientific and technological cooperation, and harmonizing national approaches with European digital policy. In the strategic perspective, this will create the conditions for increasing the competitiveness of the Ukrainian economy, accelerating its post-war recovery, and deepening its integration into the European digital space.

Therefore, responsible artificial intelligence implementation should be considered not only as one of the factors of digital transformation of the Ukrainian economy but also as a comprehensive process whose effectiveness is determined by the functioning of a mechanism for adapting European experience to national development conditions. The systemic combination of international Responsible AI principles with the needs of the Ukrainian economy provides the foundation for developing a safe, inclusive, innovative, and competitive digital economy.

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1.3. Institutional and regulatory frameworks for information security in the context of digital transformation: the experience of European Union countries and the adaptation of Ukrainian legislation

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The digital transformation of the economy and society is fundamentally altering not only the technological environment but also the very approach to state regulation, risk management and the assurance of information security. The development of artificial intelligence, digital platforms and network infrastructure requires the