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УПРАВЛІННЯ ІННОВАЦІЙНИМ РОЗВИТКОМ ПІДПРИЄМСТВА НА ЗАСАДАХ ДІДЖИТАЛІЗАЦІЇ ТА ЕКОНОМІКИ ЗАМКНЕНОГО ЦИКЛУ
MANAGEMENT OF ENTERPRISE INNOVATIVE DEVELOPMENT BASED ON DIGITALIZATION AND THE CIRCULAR ECONOMY

Хвостіков А. І. Управління інноваційним розвитком підприємства на засадах діджиталізації та економіки замкненого циклу. *Український журнал прикладної економіки та техніки*. 2026. Том 11. № 2. С. 526 – 535.

Khvostikov A. Management of enterprise innovative development based on digitalization and the circular economy. *Ukrainian Journal of Applied Economics and Technology*. 2026. Volume 11. № 2, pp. 526 – 535.

The article is devoted to the issues of managing enterprise innovative development based on digitalization and the circular economy in the context of the digital transformation of the economy, intensifying global competition, increasing resource constraints, and the need to ensure sustainable development. The relevance of the research topic is determined by the need to develop new approaches to enterprise management that integrate digital technologies, innovation management, and circular-economy principles into a unified strategic development system. Under current conditions, digitalization and the transition to the circular economy have become interrelated drivers of enterprise competitiveness, innovation, resource efficiency, and environmental sustainability, necessitating improvements in the theoretical and methodological foundations of enterprise development management. In this regard, the study aims to advance the theoretical and methodological foundations and to develop practical recommendations for managing enterprise innovation based on digitalization and the circular economy. To achieve this objective, a set of general scientific and specialized research methods was employed, including analysis and synthesis, systematization, logical modeling, comparative analysis, structuring, and scientific abstraction. The article investigates the evolution of scientific approaches to enterprise innovative development management, as well as the conceptual foundations of digital transformation, open innovation, dynamic capabilities, and the circular economy. Existing approaches proposed by foreign and Ukrainian scholars concerning the relationship between innovative development, digitalization, and enterprise resource efficiency are summarized. Current trends in integrating digital technologies into circular business models, as a prerequisite for ensuring enterprises' long-term competitiveness, are examined. It has been found that most existing scientific approaches treat digitalization, innovation, and the circular economy as relatively independent areas of research, thereby limiting the possibilities for comprehensive enterprise management. The study of the theoretical foundations of enterprise innovation management has revealed the necessity of establishing an integrated management system that combines digital technologies, innovation management, and circular-economy principles into a unified methodological framework to ensure long-term competitiveness, economic efficiency, and sustainable enterprise development. The study substantiates a concept of enterprise innovative development management that integrates digital transformation processes with the principles of the circular economy. The proposed concept includes five interrelated subsystems: digital-analytical, innovation-technological, circular-resource, organizational-competency, and strategic-ecosystem. Their interaction ensures comprehensive management of innovation processes, digital transformation, and enterprise resource efficiency. The functional purpose of each subsystem is substantiated, and its role in facilitating the enterprise's digital and circular transformation is determined. The practical value of the proposed concept lies in its applicability to the development of innovative strategies, digital transformation programs, resource-efficiency improvement mechanisms, ESG strategies, and decision support systems.

Keywords: innovations; development; innovative development management; circular economy; digital transformation; enterprise competitiveness; sustainable development.

Статтю присвячено питанням управління інноваційним розвитком підприємства на засадах діджиталізації та економіки замкненого циклу в умовах цифрової трансформації економіки, посилення глобальної конкуренції, зростання ресурсних обмежень і необхідності забезпечення сталого розвитку. Актуальність тематики дослідження зумовлена необхідністю формування нових підходів до управління підприємствами, які поєднували б цифрові технології, інноваційний менеджмент і принципи циркулярної економіки в єдину систему стратегічного розвитку. У сучасних умовах цифровізація та перехід до економіки замкненого циклу виступають взаємопов'язаними чинниками підвищення конкурентоспроможності, інноваційної активності, ресурсної ефективності та екологічної стійкості підприємств, що потребує удосконалення теоретико-методичних засад управління їхнім розвитком. У зв'язку з цим дослідження має на меті розвинути теоретико-методичні засади та розробити рекомендації щодо управління інноваційним розвитком підприємства на засадах діджиталізації й економіки замкненого циклу. Для досягнення поставленої мети використано комплекс загальнонаукових і спеціальних методів дослідження, зокрема, методи аналізу та синтезу, системного узагальнення, логічного моделювання, порівняльного аналізу, структуризації та наукової абстракції. В статті досліджено становлення наукових підходів до управління інноваційним розвитком підприємств, концептуальні положення цифрової трансформації, відкритих інновацій, динамічних здібностей підприємства та економіки замкненого циклу. Узагальнено наявні підходи зарубіжних і вітчизняних учених щодо взаємозв'язку інноваційного розвитку, цифровізації та ресурсоефективності підприємств. Досліджено сучасні тенденції інтеграції цифрових технологій із циркулярними бізнес-моделями як передумови забезпечення довгострокової конкурентоспроможності підприємств. Виявлено, що більшість існуючих наукових підходів досліджує цифровізацію, інноваційний розвиток і циркулярну економіку як відносно самостійні напрями, що обмежує можливості комплексного управління сучасними підприємствами. Дослідження теоретичних засад управління інноваційним розвитком підприємства дозволило виявити необхідність формування інтегрованої системи управління, яка поєднує цифрові технології, інноваційний менеджмент та принципи економіки замкненого циклу в єдину методологічну основу для забезпечення довгострокової конкурентоспроможності, економічної ефективності та сталого розвитку підприємств. Обґрунтовано концепцію управління інноваційним розвитком підприємства, що ґрунтується на інтеграції процесів цифрової трансформації та принципів економіки замкненого циклу. Концепція передбачає функціонування п'яти взаємопов'язаних підсистем: цифрово-аналітичної, інноваційно-технологічної, циркулярно-ресурсної, організаційно-компетентної та стратегічно-екосистемної, що забезпечує комплексне управління інноваційними процесами, цифровими перетвореннями та ресурсною ефективністю підприємства. Обґрунтовано функціональне призначення кожної підсистеми запропонованої концепції та визначено їхню роль у забезпеченні цифрово-циркулярної трансформації підприємства. Практичну цінність концепції визначено можливістю її використання під час розроблення стратегій інноваційного розвитку, програм цифрової трансформації, механізмів підвищення ресурсної ефективності, ESG-стратегій і систем підтримки управлінських рішень.

Ключові слова: інновації, розвиток, управління інноваційним розвитком, економіка замкненого циклу, цифрова трансформація, конкурентоспроможність підприємства, сталий розвиток.



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Problem statement

The current stage of development of the world economy is characterized by deep structural transformations driven by the simultaneous impact of the digital revolution, increased global competition, instability in the external environment, growing environmental challenges, and the transition to sustainable development models. Under these conditions, traditional approaches to enterprise management gradually lose their effectiveness because they focus mainly on linear models of production, resource use, and business process organization. On the other hand, modern enterprises operate in an environment characterized by rapid technological change, constant updates to digital technologies, dynamic shifts in consumer demand, stricter environmental requirements, and the need to ensure long-term competitiveness.

The determining factor in the development of modern business was digitalization, which transformed not only individual production or management processes but also the very logic of enterprise functioning. The use of artificial intelligence technologies, the Internet of Things, digital platforms, big data, cloud services, digital twins, and other tools of the digital economy provides fundamentally new opportunities for managing information flows, forecasting market trends, automating management decision-making, and forming innovative business models. As a result, digitalization is shifting from a technological tool for modernization to a strategic factor in enterprise development.

In parallel with digital transformation, the concept of a circular economy is spreading, which involves abandoning the traditional model of "production – consumption – utilization" in favor of continuous resource recovery, reuse of materials, the development of remanufacturing and recycling, environmental product design, and the formation of circular value chains. The implementation of circular economy principles not only reduces the resource intensity of production and the negative environmental impact, but also creates new sources of economic efficiency, increases the enterprise's investment attractiveness, and ensures its long-term sustainability.

The problems of digital transformation, innovation, and the circular economy are mostly studied in isolation. In the works of foreign and domestic scientists, the issues of strategic management of innovations, digitalization of business processes, development of open innovation, resource efficiency, circular business models, and environmental modernization of production have been thoroughly examined. However, much less attention is paid to developing an integrated management system that combines digital technologies, innovative management, and the principles of a circular economy into a single methodological basis for enterprise development. Enterprise practice also confirms the existence of this problem. A significant number of business entities implement individual digital solutions or environmental initiatives, but these measures are often local in nature, not integrated into the overall strategic management system, and fail to deliver the expected synergistic effect. As a result, enterprises experience low innovation performance, insufficient digital maturity, inefficient resource use, rising operating costs, and a loss of competitive advantage in the digital economy.

Therefore, there is an objective need to develop and substantiate new conceptual approaches to the management of enterprises' innovative development, which would ensure the comprehensive integration of digital transformation, innovation activities, and the principles of the circular economy into a single strategic management system. This determines the study's relevance and theoretical and practical significance.

The problems of managing the innovative development of enterprises in the context of digital transformation and the transition to a circular economy are a focus of attention for both foreign and domestic scientists. The theoretical foundations of innovative development were laid by J. A. Schumpeter [1; 2], who considered innovation a key source of economic growth and competitive advantage. Strategic aspects of ensuring the competitiveness of enterprises based on innovation are substantiated by M. E. Porter [3], while the concept of open innovation was formulated by G. Chesbro [4]. A significant contribution to the development of the theory of the digital economy was made by D. Tapscott [5], and the issues of the circular economy and new business models are covered in the works of W. R. Stahel [6], J. Jonker [7] and experts of the Ellen MacArthur Foundation [11]. The development of modern approaches to managing innovation processes is also associated with D. J. Miller's theory of dynamic abilities. Tisza [8], the concept of disruptive innovation by K. M. Christensen [9], the model of the learning organization by P. M. Senge [10], and the ideas of K. Schwab [12] on the impact of the Fourth Industrial Revolution on business transformation.

Among Ukrainian scientists, a significant contribution to the study of innovative development of enterprises, digital economy and sustainable development was made by V. M. Heyets [13], A. A. Chukhno [14], L. I. Fedulova [15], O. I. Amosha, V. P. Vyshnevsky, L. O. Zbarazska [16], V. S. Ponomarenko, M. O. Kyzym, O. M. Tyshchenko [17], O. A. Grishnova [18], V. V. Apalkova [19], A. A. Hrytsenko [20], S. M. Ilyashenko [21], O. V. Prokopenko [22], I. M. Sotnyk [23], T. G. Vasylytsiv [24], N. M. Andreeva [25] and V. E. Khaustova [26]. Their work examines issues in innovation management, digital transformation, human capital development, greening of production, resource saving, the circular economy, and ensuring enterprise competitiveness.

At the same time, a literature review showed that most existing studies treat innovative development, digitalization, and the circular economy as separate areas of scientific research. Insufficient attention is paid to developing integrated approaches to managing an enterprise's innovation that combine digital transformation, modern innovative technologies, and the principles of the circular economy into a single strategic management system, thereby underscoring the relevance and scientific significance of the study.

Formulation of the article's objectives

The purpose of the study is to develop theoretical and methodological foundations and recommendations for managing an enterprise's innovative development based on digitalization and a closed-cycle economy.

To achieve this goal, the following interrelated tasks have been identified:

to investigate the formation of scientific views on the management of innovative development of an enterprise and to generalize modern theoretical approaches to digital transformation and the circular economy;

to systematize the conceptual provisions of foreign and domestic scientific schools regarding the innovative development of enterprises and to determine the directions of their further development;

to improve the conceptual provisions for managing enterprises' innovative development based on digitalization and a closed-cycle economy.

Presentation of the main research material

Global transformations in the world economy, the acceleration of digitalization in business processes, the spread of the concept of sustainable development, and the tightening of resource constraints are significantly reshaping traditional approaches to enterprise management. If a few decades ago material resources, scale of production, and price competition

were considered the main sources of competitive advantage, today the determining factors of long-term development are innovation, digital technologies, intellectual capital, the ability of the enterprise to quickly adapt to changes in the external environment, and the formation of new business models. At the same time, the integration of circular economy principles, focused on the rational use of resources, the minimization of waste, the reuse of materials, and the formation of circular production systems, is becoming increasingly important.

The combination of the processes of digital transformation and the development of the circular economy forms a new management paradigm, according to which the innovative development of an enterprise is considered not only as a process of creating new products or technologies, but as a comprehensive renewal of the entire management system, covering organizational structures, production processes, business models, interaction with stakeholders, logistics chains and information support for managerial decision-making. Under these conditions, the generalization of existing theoretical approaches to the management of enterprises' innovative development, developed by foreign and Ukrainian scientists, to identify modern trends in the development of managerial science and to substantiate the directions of its further evolution becomes especially relevant.

The study of the problems of managing the innovative development of enterprises originates in the fundamental works of the Austrian economist J. Schumpeter, who was among the first to develop a holistic theory of innovation as a driving force of economic development. In his work "The Theory of Economic Development", the scientist proved that economic growth does not result from the equilibrium functioning of the market, but from the constant emergence of new combinations of factors of production, implemented by innovative entrepreneurs [1]. According to the researcher, innovations bring structural changes to the economy, create new markets, transform existing production systems, and create new competitive advantages.

The concept of innovation was further developed by J. Schumpeter, who was already devoted to the phenomenon of "creative destruction". The scientist demonstrated that each new technological wave destroys obsolete economic structures while creating fundamentally new opportunities for enterprise development [2]. This approach has become the basis of the modern understanding of innovation management, according to which an enterprise must constantly update its technologies, organizational structure, and business processes to ensure long-term competitiveness.

An important stage in the development of the theory of strategic management of innovations was the research by M. Porter, who proposed the concept of the enterprise's competitive advantages. The scientist proved that innovations are not isolated technological solutions but rather integrated elements of an enterprise's competitive strategy [3]. According to the proposed value chain model, innovation should cover all business processes of the enterprise – from resource procurement and production to marketing, logistics, and after-sales service. It is the comprehensive renewal of each link in the value chain that ensures the formation of sustainable competitive advantages.

M. Porter's provisions have become especially relevant in the context of the economy's digital transformation. Modern digital technologies enable the integration of individual elements of the value chain into a single information system, significantly increasing the speed of management decisions, the transparency of business processes, and the efficiency of resource use. Thus, digitalization is not only a technological modernization of the enterprise, but also a tool for implementing the strategic concept of competitive advantages proposed by M. Porter.

Further evolution of the theory of innovative development is associated with the formation of the concept of open innovation, the author of which is Chesbrow G. In the monograph [4], the researcher demonstrated that modern enterprises can no longer provide effective innovation exclusively through their own research departments. Significantly higher efficiency is achieved through the integration of internal and external knowledge sources and active cooperation with universities, startups, research centers, suppliers, and consumers.

The concept of open innovation has changed the traditional understanding of an enterprise's innovation activity. If the classical model provided a closed cycle of research, development, and commercialization of innovations within the company, then the modern approach is based on the networked interaction among many participants in the innovation ecosystem. In the digital economy, such interaction is provided by cloud technologies, digital platforms, knowledge management systems, artificial intelligence, big data technologies, and the Internet of Things. Digital platforms create an information infrastructure for the continuous exchange of knowledge, accelerate technology transfer, and shorten the commercialization cycle of innovations.

A significant contribution to the development of the modern concept of the digital economy was made by the Canadian researcher Tapscott D. In his work [5], he was among the first to demonstrate that digital technologies transform not only information processes but also the entire architecture of enterprise operations. The scientist noted that digitalization changes the nature of management, drives the transition from hierarchical organizational models to network structures, enables real-time integration of production processes, and creates fundamentally new mechanisms for interacting with consumers.

Further research by D. Tapscott demonstrates that digital technologies are gradually turning from an auxiliary automation tool into a strategic resource for enterprise development. In the context of the widespread use of artificial intelligence, digital platforms, blockchain technologies, and big data, the management of innovative development becomes a continuous process of the enterprise's adaptation to changes in the external environment.

The theory of innovative development was also significantly developed in the works of V. Stahel, who laid the foundation for the modern concept of the circular economy. The scientist demonstrates that the economic efficiency of an enterprise increasingly depends not on the scale of natural resource consumption, but on the ability to extend the life cycle of products as much as possible, reuse materials, carry out repairs, modernization, restoration, and recycling [6]. Accordingly, the enterprise's innovative development should focus not only on creating new products but also on developing new models for organizing production, service maintenance, and the management of resource flows.

Further development of the circular economy concept is associated with the scientific work of Jonker J., who considers it not only an environmental concept but also a fundamentally new business model that changes the nature of the creation, distribution, and consumption of economic value. According to the researcher, traditional business models that focus on the linear principle of "extraction – production – consumption – utilization" are gradually losing their effectiveness due to resource constraints, rising raw material costs, increasing environmental requirements, and a growing emphasis on responsible consumption. Under these conditions, enterprises should shift to business models based on resource sharing, reproduction, servitization, product recovery, remanufacturing, recycling, and the development of partner networks [7] (Fig. 1).

Jonker J. pays special attention to the process of transformation of the logic of value creation. If in the traditional economic model, the added value is formed mainly through the production and sale of new products, then in the circular economy it is created throughout the entire life cycle of the product, including its maintenance, modernization, repair, reuse of

individual components, and return of materials to the production cycle. This approach significantly expands the scope of enterprise management of innovation, since innovation should encompass not only production technologies but also the organization of after-sales service, the management of resource flows, logistics networks, and digital platforms for consumer interaction.

Of significant theoretical importance for the development of the modern concept of innovation management is the research by D. Tisse, who formulated the theory of dynamic capabilities of the enterprise. The scientist demonstrates that the sustainable competitive advantages of an enterprise are determined less by available resources than by its ability to promptly detect changes in the external environment, quickly rebuild its competencies, integrate new knowledge, and transform business processes in accordance with new operating conditions [8].

In contrast to the resource theory of the enterprise, which focuses on the accumulation of strategic resources, the concept of dynamic capabilities views innovation as a continuous process of organizational learning, adaptation, and renewal. In the context of digital transformation, the provisions of this theory are particularly important, since the pace of change in technologies, digital platforms, and business models far exceeds the rate of renewal in traditional production systems. That is why the effective management of innovative development increasingly depends on the enterprise's ability to develop digital competencies and integrate technologies such as artificial intelligence, machine learning, the Internet of Things, digital twins, and big data analytics into its strategic management system.

A similar position is held by Christensen K., who investigated the nature of radical innovations and formed the concept of disruptive innovation. The scientist convincingly proved that the most successful enterprises often lose their market positions precisely because of the focus on the gradual improvement of existing products. In contrast, new competitors use fundamentally different technological solutions that can form new markets or radically change the structure of existing ones [9].

An important aspect of K. Christensen's concept is the idea that an organization must develop a culture that not only supports innovation but also tolerates experimentation, high levels of uncertainty, and the possibility of errors. In the modern digital economy, such a management model is implemented through Agile approaches, including Scrum, Design Thinking, the Lean Startup, and other methodologies for the agile management of innovative projects. They enable quick testing of business hypotheses, shorten the product development cycle, and allow enterprises to adapt to constant changes in the market environment (Table 1).

Table 1. Methodologies of flexible management of innovative development of enterprises in the digital economy and their characteristics

Methodology	Contents	Implementation tools	Impact on the innovative development of the enterprise
Agile	Agile project management based on rapid adaptation to changes and continuous improvement	Iterative planning, short development cycles (sprints), regular feedback, self-organized teams	It shortens the innovation development cycle, increases the enterprise's adaptability to external changes, and enables a quick response to market needs
Scrum	Agile framework for organizing teamwork on innovative projects	Product Backlog, Sprint Backlog, Sprint Review, Daily Scrum, Scrum Master	Ensures effective coordination of teams, accelerates the creation of new products, increases the transparency of management processes
Design Thinking	A human-centered approach to creating innovations through a deep understanding of consumer needs	Empathy, problem definition, idea generation, prototyping, testing	Contributes to the creation of innovative products with high consumer value, minimizes the risks of non-compliance with market needs
Lean Startup	Methodology for quickly creating and testing business hypotheses with minimal expenditure of resources	Minimum Viable Product (MVP), Build–Measure–Learn, Customer Development, Pivot	Reduces innovation risks, provides quick verification of the viability of business ideas, optimizes the use of resources
Kanban	Visual management of workflows and optimization of business processes	Kanban Board, Work in Progress (WIP), a continuous flow of tasks	Increases the productivity of innovative teams, optimizes the use of resources, reduces the time of task completion
DevOps	Integration of software development processes and operation of information systems	Continuous Integration (CI), Continuous Delivery (CD), Test and Deployment Automation	Accelerates the implementation of digital innovations, ensures high quality of software products and continuity of their improvement

Source: systematized by the author

An equally significant contribution to the development of the theory of innovation management was made by Senge P., who formed the concept of a learning organization. According to the researcher, the key condition for the long-term development of an enterprise is its ability to continuously accumulate, disseminate, and use new knowledge. The organization should function as an integrated system in which learning is an integral part of all management processes [10]. Senge P. emphasizes that digitalization significantly expands the possibilities of organizational learning. Corporate information systems, digital knowledge bases, cloud services, distance learning platforms, and artificial intelligence tools ensure the continuous exchange of information among employees, accelerate knowledge dissemination, and create conditions for the formation of an innovative culture within the enterprise. Thus, the management of innovation is increasingly integrated with the management of knowledge, human capital, and digital competencies among personnel.

In the last decade, numerous foreign studies have examined the relationship between digital transformation and the circular economy. In particular, the reports of MacArthur H. emphasize that digital technologies are becoming a key factor in the practical implementation of the circular economy. The use of the Internet of Things, sensor systems, RFID technologies, blockchain, artificial intelligence, and digital platforms enables the tracing of resource flows, the optimization of production

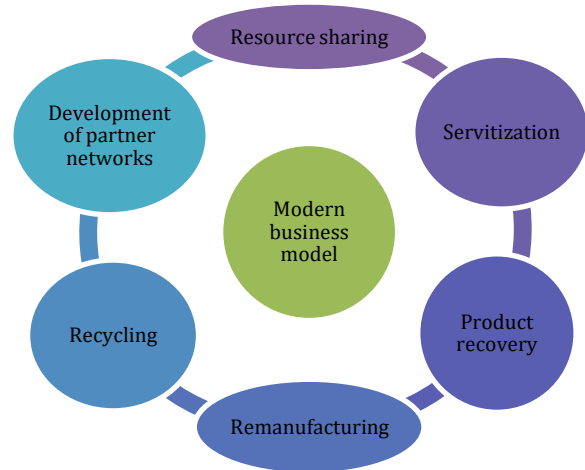


Fig. 1. The modern business model is based on the theory of closed loops. Source: compiled by [7]

processes, the prediction of the technical condition of equipment, the management of the product life cycle, and the efficient recycling of materials [11].

Digital technologies must provide transparent information about the origin of materials, the environmental characteristics of products, and the conditions under which they are produced. This allows enterprises to make informed management decisions regarding resource reuse, minimize production losses, optimize logistics processes, and increase overall production resource efficiency.

Further development of these ideas was reflected in the works of researchers on the Industry 4.0 concept, among which K. Schwab's work occupies an important place. The scientist emphasizes that the Fourth Industrial Revolution is characterized by the integration of digital, physical, and biological technologies, which radically changes how production is organized, enterprises are managed, and economic entities interact [12]. Under these conditions, digitalization is no longer a separate direction of enterprise modernization, but becomes the basic platform for its strategic development.

We see that most researchers are gradually moving away from interpreting innovative development as an exclusively technological process. Instead, it is increasingly seen as a comprehensive strategic management system that combines digital technologies, organizational change, human capital development, open innovation, networking, circular business models, and sustainable development principles. The evolution of foreign scientific thought indicates a consistent transition from classical theories of innovation to the modern integrated concept of digital-circular development of enterprise. From J. Schumpeter's ideas on innovation as a source of economic growth, through the strategic approach of M. Porter, the concept of open innovation by G. Chesbro, the theory of dynamic abilities by D. Thies, the model of the learning organization, by P. Senge and the concept of disruptive innovations by K. Christensen, scientific thought has evolved to the modern understanding of the enterprise as a digital innovation ecosystem functioning in accordance with the principles of the circular economy and sustainable development.

Domestic economic science has also formed a significant theoretical and methodological basis for the study of enterprises' innovative development, adapting the classical provisions of world economic thought to the peculiarities of the functioning of the national economy, transformation processes, the digitalization of the business environment, and modern challenges of sustainable development. Unlike most foreign studies, in which the analysis of innovations as a factor of competitive advantages prevails, Ukrainian scientists pay considerable attention to the relationship of innovative development with the structural modernization of the economy, the formation of the national innovation system, the increase in investment activity of enterprises, the development of human capital, and ensuring the economic security of the state.

One of the founders of the modern Ukrainian school of research on innovative development is Academician V. Heyets, whose works are devoted to the problems of structural transformation of the economy, innovative modernization of production, and the formation of a model of sustainable economic development. The scientist argues that the innovative development of enterprises cannot be considered in isolation from broader economic processes, since the effectiveness of innovations is determined by the level of development of the institutional environment, the financial system, state innovation policy, and the investment climate [13]. According to the researcher, innovation is a key factor in ensuring long-term economic growth. Still, its effectiveness largely depends on the state's ability to create favorable conditions for the development of science, technology, and entrepreneurship.

An important aspect of V. Heyets' scientific research is substantiating the need to transition from the resource-raw-material model of the economy to the knowledge economy, in which the determining factors of competitiveness are human capital, scientific research, and digital technologies. That is why digitalization is considered not an independent direction of development but one of the key tools for implementing an innovative model of economic growth.

A significant contribution to the development of the theory of innovative development was made by Academician A. Chukhno, who investigated the regularities of the formation of the post-industrial economy and the transformation of economic systems under the influence of scientific and technological progress. The scientist was among the first in Ukrainian economic science to draw attention to the fact that information, knowledge, and intellectual capital are gradually becoming the main factors of economic development, displacing traditional production resources [14]. In his opinion, the competitiveness of enterprises is increasingly determined by the ability to create new knowledge, quickly commercialize it, and integrate it into production processes.

The conceptual provisions of A. Chukhno have become especially relevant in the context of modern digital transformation. If earlier information resources served an auxiliary function, today they have become a strategic asset for the enterprise, ensuring management efficiency, accelerating innovation, and increasing the business's adaptability to dynamic changes in the external environment.

A significant contribution to the development of the methodology of innovative development of enterprises was made by L. Fedulova. In her research, the scientist considers innovation the basis for ensuring the competitiveness of the national economy, emphasizing that a modern enterprise should develop a holistic system of innovation management that integrates strategic planning, management of innovation projects, human capital development, and the effective use of digital technologies [15]. L. Fedulova pays special attention to the development of innovation infrastructure, the formation of regional innovation ecosystems, the development of clusters, technology parks, and technology transfer centers. The scientist notes that modern innovation is increasingly networked, as enterprises, universities, research institutions, investors, and public authorities form a single system for creating and commercializing knowledge.

Further development of the theoretical foundations of innovation management was reflected in the works of Amosh O., who investigates the problems of industrial modernization, the innovative development of enterprises, and the structural restructuring of the economy. The scientist emphasizes that effective management of innovation should be based on a comprehensive combination of technological, organizational, financial, and institutional development mechanisms [16]. At the same time, digital technologies are given a special role as tools for integrating production processes, automating management, and increasing labor productivity. The ideas of Amosha O. become especially relevant in the context of Industry 4.0, where the digitalization of production enables not only the automation of individual operations but also the creation of integrated cyber-physical production systems that can autonomously analyze data, predict production risks, and optimize resource use.

Considerable attention is paid to the problems of enterprises' innovation activity by Ponomarenko V. The scientist substantiates the need for systematic management of innovative development, in which all elements of the enterprise should function as an interconnected system. In his opinion, the effectiveness of innovation activity is determined not by individual technological solutions but by the level of coherence among strategic, organizational, personnel, financial, and information

processes [17]. Special attention is paid to the assessment of enterprises' innovation potential by Ponomarenko V. The scientist demonstrates that innovation potential is a multidimensional category encompassing personnel, production, financial, investment, informational, and organizational components.

An important place among modern Ukrainian studies is occupied by the works of O. Grishnov, devoted to the development of human capital and intellectual potential of enterprises. The researcher convincingly demonstrates that digitalization significantly changes the requirements for employees' competencies, fostering the need for continuous learning, digital literacy development, and knowledge management [18]. In this regard, the enterprise's innovative development increasingly depends on personnel's ability to work with digital technologies, use analytical systems to support decision-making, and quickly adapt to technological changes.

In the last decade, research on the digital transformation of the economy and its impact on the innovative development of enterprises has developed rapidly. Among Ukrainian scientists, V. Apalkova made a significant contribution to the development of the theoretical foundations of the digital economy, being among the first to systematically substantiate the economic essence of digitalization as a complex process of transforming socio-economic relations under the influence of modern information and communication technologies. The scientist argues that digitalization should not be identified exclusively with the automation of production or the introduction of individual software products. It represents a qualitatively new stage in the development of economic systems, in which digital data, information resources, and digital platforms become the main production resources alongside labor, capital, and natural resources [19].

In V. Apalkova's works, special attention is paid to the transformation of enterprise management mechanisms in the digital economy. The researcher notes that digitalization contributes to the transition from traditional vertical management models to networked organizational structures, in which information flows with minimal time delays and management decisions are made based on the analysis of large amounts of data. This approach significantly expands enterprises' capabilities to predict market changes, respond promptly to risks, and tailor offers to consumers.

A similar position is held by Academician A. Hrytsenko, who considers the digital economy a natural stage in the development of the modern economic system, accompanied by transformations in value-creation mechanisms, changes in competition, and the formation of new economic institutions [20]. The scientist emphasizes that digital technologies are gradually changing the very nature of economic relations, since information, knowledge, and the speed of data processing are becoming the main sources of competitive advantage, according to A. Hrytsenko, the management of an enterprise's innovative development should focus not only on the introduction of new technologies but also on developing institutional mechanisms for digital interaction among the state, business, scientific institutions, and society. It is the integration of digital infrastructure, the innovation ecosystem, and modern mechanisms of state regulation that creates the prerequisites for increasing enterprises' innovation activity.

An important place in modern studies of innovation management is occupied by the works of Ilyashenko S., devoted to the marketing of innovations, the strategic management of innovation activity, and the development of the innovation potential of enterprises. The scientist considers innovative development a complex, multi-stage process that includes generating new ideas, their economic evaluation, developing innovative products, commercializing research results, and managing the innovation life cycle [21]. A distinctive feature of Ilyashenko S.'s approach is a combination of strategic management and the marketing concept of innovations. The scientist proves that the effectiveness of innovations is determined not only by their technological novelty but also by their ability to meet consumer needs, create new market segments, and provide the enterprise with long-term competitive advantages. In today's digital transformation, this concept takes on new meaning, as digital technologies enable constant monitoring of consumer needs, analysis of customer behavior, and rapid adjustment of innovation strategies.

A significant contribution to the development of environmentally oriented innovation was made by the research of Prokopenko O., which focused on environmental innovations, sustainable development, and the circular economy. The scientist argues that modern enterprises should consider environmental innovations not as additional costs but as a strategic factor for increasing competitiveness, investment attractiveness, and economic efficiency [22]. Her research focuses on the development of ecological entrepreneurship, the introduction of resource-saving technologies, environmental marketing, and the formation of sustainable production models.

Further development of these provisions was reflected in the works of I. Sotnyk, who conducts comprehensive research on the economics of resource saving, the circular economy, and the management of environmental innovations. The researcher emphasizes that the formation of a circular economy requires a radical transformation of management approaches at the enterprise level. It is not only about introducing waste-recycling technologies but also about rethinking the entire value-creation system, from the environmental design of products to the organization of their reuse, repair, remanufacturing, and recycling [23]. Particular attention should be paid to the provision of Sotnyk I. on the need to integrate digital technologies with circular business models. The scientist notes that digital platforms, the Internet of Things, artificial intelligence, and blockchain technologies enable full tracking of material flows, resource optimization, control of environmental indicators, and the organization of closed production cycles. Thus, digitalization is a prerequisite for the effective implementation of circular economy principles.

An integrated approach to the problems of digital transformation in enterprises is presented in the works of Vasylytsiv T., who considers digitalization a key factor in ensuring the economic security and competitiveness of enterprises. The scientist emphasizes that digital transformation significantly changes the strategic management system by enabling rapid information accumulation, improving the quality of analytical support for decision-making, and creating conditions for prompt responses to external environmental risks [24].

An important direction of modern Ukrainian research is the study of the relationship between digital transformation and sustainable development of enterprises. In particular, the works of N. Andreev investigate the mechanisms for the formation of a circular economy, the development of "green" industry, resource efficiency, and the greening of business processes. The researcher emphasizes that the modernization of enterprise management systems should accompany the transition to a circular business model, the development of digital infrastructure, and the active use of environmental innovations [25].

In her research, the scientist demonstrates that digitalization enhances the efficiency of enterprise management by integrating information flows, leveraging modern analytical tools, and developing digital platforms for interaction among all participants in business processes [26].

From the analysis of the above sources, we see the gradual emergence of a new interdisciplinary direction that integrates theories of innovative development, the digital economy, sustainable development, and the circular economy. At the same time, most of the scientific work focuses on individual components of these processes. Some authors focus on the digitalization of management, others on the development of innovation potential, and still others on environmental innovations or resource saving. In addition, Ukrainian researchers are gradually shifting the emphasis from the traditional understanding of innovation activity as the introduction of new equipment or technologies to a comprehensive vision of innovative development as a multilevel system of strategic enterprise management. At the same time, issues such as digital transformation, human capital development, knowledge management, the development of innovation infrastructure, and the integration of enterprises into national and international innovation networks are becoming increasingly important. At the same time, it should be noted that in most studies, digitalization and the circular economy are still considered mainly as separate areas of development, while their integration into a single management system for an enterprise's innovative development remains insufficiently developed.

Significant conceptual diversity and a high level of scientific study of certain aspects of innovation activity characterize the modern theory of management of innovative development of enterprises. At the same time, most existing concepts were formed in different historical periods and reflect the evolution of economic relations, so their methodological provisions do not always fully align with the modern conditions of enterprise operation. Classical theories of innovation mainly focus on the technological renewal of production, the formation of competitive advantages or the development of entrepreneurial activity, while modern digital transformations significantly expand the content of innovative development, encompassing the digitalization of business processes, data management, the development of digital platforms, the integration of artificial intelligence, the formation of digital ecosystems and ensuring resource efficiency.

The concepts of open innovation, dynamic capabilities, organizational learning, and digital transformation largely focus on developing intellectual capital, digital competencies, and network interactions among participants in the innovation ecosystem. At the same time, the environmental effectiveness of innovations, resource efficiency, and the integration of circular economy principles are often considered separate areas of research, with insufficient integration into the enterprise's strategic management system. A similar situation is observed in circular economy studies, which focus on the environmental aspects of resource reuse, recycling, remanufacturing, and conservation. At the same time, digital technologies are considered mainly as auxiliary tools for implementing circular business models.

The analysis of the works of Ukrainian scientists also showed a gradual expansion of the research subject area from the problems of enterprises' innovative activity to issues of the digital economy, sustainable development, the greening of production, and the development of human capital. At the same time, most scientific works are devoted to specific components of these processes, which determines the fragmentation of methodological support for managing innovative development. The issues of comprehensively integrating digital transformation, the principles of the circular economy, innovation management, strategic management, digital analytics, and environmental responsibility into a single enterprise development management system remain insufficiently studied. In addition, there are practically no universal conceptual models in the scientific literature that would allow for the synchronization of digital transformation, the management of innovation potential, and the circular transformation of the enterprise within a single management mechanism.

We note the need to move from studying individual components of digitalization or the circular economy to developing an integrated management concept that ensures the simultaneous achievement of economic efficiency, technological modernization, environmental sustainability, and the enterprise's long-term competitiveness. It is this scientific problem that determines the feasibility of developing the author's concept for managing an enterprise's innovative development based on digitalization and a closed-cycle economy.

The current stage of enterprise development is characterized by the simultaneous influence of two interrelated global trends. The first trend is the rapid digital transformation of economic processes, accompanied by the widespread use of artificial intelligence, big data, the Internet of Things, digital platforms, robotics, cloud services, and digital twins. The second trend concerns the world economy's transition toward the principles of sustainable development and a circular economy, which orient enterprises to minimize resource losses, reduce environmental burdens, extend product lifecycles, and develop circular business models.

In our opinion, these trends should not be considered as independent directions of enterprise transformation, which we have found in most foreign and domestic studies. On the contrary, it is their integration that creates a qualitatively new management system capable of providing a synergistic effect from the simultaneous use of digital technologies and the principles of the circular economy. In this regard, we propose a concept for managing the enterprise's innovation, in which digitalization serves as the intellectual and informational basis for managerial decision-making. At the same time, the circular economy determines the strategic vector of resource use, the formation of a business model, and the long-term sustainability of the enterprise. Unlike existing approaches, the proposed concept is based on the premise that innovative development is not a separate functional area of the enterprise but an integrated system for the continuous transformation of all business processes under the influence of digital technologies, innovations, environmental requirements, changes in the market environment, and stakeholder needs. At the same time, digitalization provides information transparency, speed of data analysis, automation of management, and forecasting of development, while the circular economy determines the directions for optimizing resource flows, minimizing waste, reusing materials, and creating long-term economic value.

We are convinced that it is advisable to consider the management of innovative development of an enterprise as a continuous adaptive process of strategic, organizational, technological, and resource transformation of an enterprise, which is based on the integrated use of digital technologies, innovative management tools and principles of a circular economy to form long-term competitive advantages, increase resource efficiency, ensure environmental sustainability and increase in value enterprises.

The proposed concept is based on the interaction of five interrelated functional subsystems (Fig. 2):

The first subsystem is digital-analytical. Its purpose is to form a single digital information space for the enterprise by integrating ERP, CRM, SCM, and MES systems, Business Intelligence technologies, artificial intelligence, Big Data, and digital platforms.

The implementation of the digital-analytical subsystem creates conditions for the formation of a unified information environment of the enterprise, the integration of all management processes, the increase in the efficiency of obtaining management information, and the improvement in the quality of strategic decisions. The use of modern digital platforms, business intelligence systems, artificial intelligence, and Big Data technologies enables timely risk identification, trend

forecasting, modeling of alternative management scenarios, and the justification of investment and innovation decisions. This helps reduce the time required to make managerial decisions, increase their validity, and reduce managerial uncertainty.

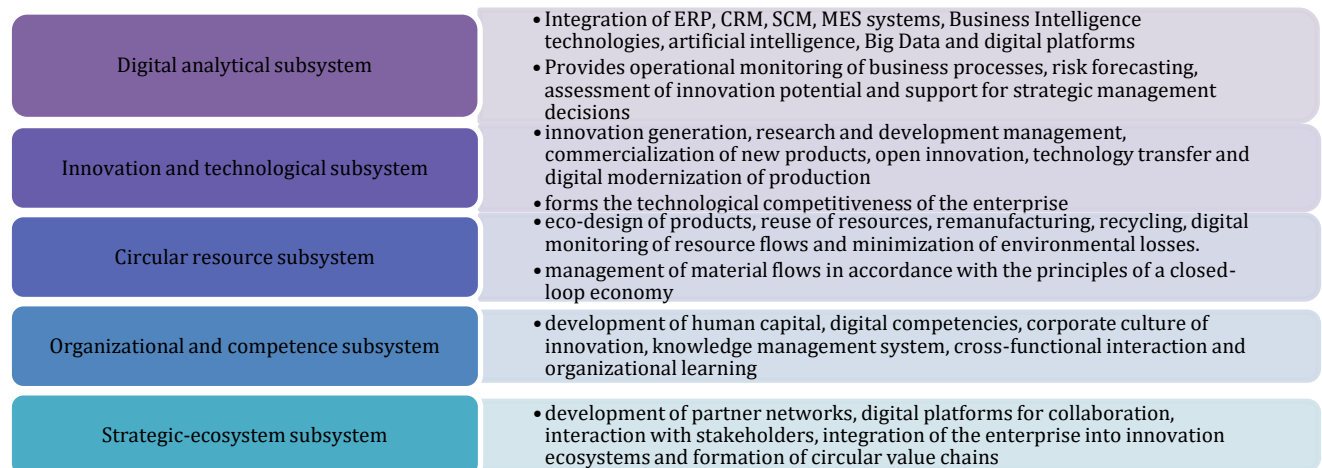


Fig. 2. The concept of managing an enterprise's innovative development based on digitalization and a closed-cycle economy. Source: author's development

The second subsystem is innovation and technology. It covers the processes of innovation generation, research and development management, commercialization of new products, open innovations, technology transfer, and digital modernization of production.

The innovation and technological subsystem enables the enterprise to systematize the processes of generating, selecting, implementing, and commercializing innovations, ensuring continuous updating of products, technologies, and business processes. Its implementation helps shorten the innovation cycle, increase the efficiency of the use of scientific and technical potential, accelerate technology transfer, and accelerate the development of open innovation. As a result, the enterprise can quickly adapt to changes in the market environment, strengthen its competitive position, and create new sources of value.

The third subsystem is circular-resource. Its purpose is to manage material flows in accordance with the principles of a circular economy. It provides for the eco-design of products, the reuse of resources, remanufacturing, recycling, digital monitoring of resource flows, and the minimization of environmental losses.

The importance of the circular-resource subsystem lies in ensuring effective management of resource flows in accordance with the principles of the circular economy. Its use helps reduce the consumption of primary raw materials, minimize production waste, optimize material costs, increase the share of resource reuse, and develop environmentally oriented production processes. At the same time, digital monitoring of resource flows increases the transparency of material resource use, enables quick identification of losses and the development of effective solutions to minimize them, thereby positively affecting both the enterprise's economic results and its environmental responsibility.

The fourth subsystem is organizational-competency. It is based on the development of human capital, digital competencies, a corporate culture of innovation, a knowledge management system, cross-functional interaction, and organizational learning.

The implementation of the organizational and competence subsystem aims to develop human capital as a key driver of innovation. The development of digital competencies among personnel, the development of a corporate culture of innovation, knowledge management systems, and organizational training increase employees' readiness for the introduction of digital technologies, accelerate the enterprise's adaptation to technological changes, and contribute to the development of innovative activity. The practical result of this subsystem's operation is increased labor productivity, improved interfunctional efficiency, faster knowledge dissemination, and the creation of an innovative environment within the enterprise.

The fifth subsystem is strategic-ecosystem. Its content is the development of partner networks, digital platforms for cooperation, interaction with stakeholders, integration of the enterprise into innovation ecosystems, and the formation of circular value chains.

The strategic-ecosystem subsystem ensures the enterprise's integration into modern innovation ecosystems and the development of partnerships with scientific institutions, investors, authorities, suppliers, consumers, and other stakeholders. Its implementation creates the prerequisites for open innovation, increased access to external knowledge, digital collaboration platforms, and circular value chains. This allows the enterprise to use external innovation potential more efficiently, increase investment attractiveness, and accelerate the implementation of strategic development projects.

The practical value of the proposed concept of managing the innovative development of an enterprise based on digitalization and a circular economy lies in the possibility of using it as a comprehensive methodological basis for the formation of a modern system of strategic management of an enterprise, focused on the simultaneous achievement of innovative, economic, digital, and environmental performance. In contrast to existing approaches, the proposed concept integrates digital technologies, innovation management, and the principles of the circular economy into a single management system, enabling enterprises to undertake a comprehensive digital-circular transformation without fragmented implementation of individual innovations.

The complex functioning of the proposed subsystems ensures a synergistic effect, manifested in the mutual enhancement of their effectiveness. The integration of digital technologies with the principles of the circular economy creates the conditions for an adaptive management system that can respond quickly to changes in the external environment, optimize resource use, ensure continuous innovation, and maintain the enterprise's high level of competitiveness. In contrast to the isolated implementation of digital or environmental solutions, the integrated implementation of the concept enables more significant economic, technological, social, and environmental outcomes.

The proposed concept has a universal character and can be adapted to enterprises engaged in various economic activities, with varying scales of operation and organizational and legal forms. Its provisions can be used to develop innovative development strategies, digital transformation programs, resource efficiency policies, environmental modernization programs, ESG strategies, and to form internal standards for managing innovation activities. In addition, the concept provides a methodological basis for the further development of an organizational and economic mechanism, a methodology for assessing the effectiveness of digital-circular transformation, a system of key performance indicators, and tools to support the strategic management of enterprises' innovative development.

Thus, the value of the proposed concept lies not only in improving existing approaches to managing innovative development but also in developing a holistic model of digital-circular enterprise management that synchronizes innovation processes, digital transformation, and resource efficiency. Its application will contribute to increasing enterprises' digital maturity, accelerating the introduction of innovations, optimizing resource use, strengthening competitive positions, increasing investment attractiveness, and ensuring the long-term sustainability of development in the digital economy and the transition to a circular economy.

Conclusions and prospects for further exploration

The study of the theoretical foundations of management of innovative development of an enterprise has shown that modern management science is at the stage of forming a new paradigm of development, in which digital transformation and the closed-loop economy cease to be separate areas of modernization and acquire signs of interrelated components of a single system of strategic management. Generalization of the works of foreign and domestic scientists has shown that existing concepts have made a significant contribution to the development of theories of innovation management, digitalization, and the circular economy, but, for the most part, they focus on specific aspects of these processes. This limits the possibilities for integrated enterprise management amid high technological dynamics, increasing resource constraints, and growing requirements for business environmental responsibility.

As a result of critical analysis, the need to transition to an integrated management model that combines digital technologies, innovation activities, and circular-economy principles into a single system for the enterprise's strategic development is substantiated. The proposed conceptual vision proceeds from the fact that digitalization should provide an information and analytical basis for management, innovation - continuous updating of products, technologies, and business processes, and circular economy - rational use of resources, minimization of losses, and formation of long-term economic, environmental, and social value.

The practical implementation of this approach will create the prerequisites for increasing enterprises' digital maturity, accelerating innovation processes, developing adaptability to external environmental changes, strengthening competitive positions, and ensuring the long-term sustainability of operations. This indicates the expediency of further development of theoretical and methodological provisions on the formation of integrated mechanisms for managing the innovative development of enterprises based on digitalization and the circular economy, thereby determining the prospects for further scientific research in this direction.

Література

1. Schumpeter, J. A. (1934). The theory of economic development. Harvard University Press.
2. Schumpeter, J. A. (1942). Capitalism, socialism and democracy. Harper & Brothers.
3. Porter, M. E. (1985). Competitive advantage: Creating and sustaining superior performance. Free Press.
4. Chesbrough, H. (2003). Open innovation: The new imperative for creating and profiting from technology. Harvard Business School Press.
5. Tapscott, D. (1995). The digital economy: Promise and peril in the age of networked intelligence. McGraw-Hill.
6. Stahel, W. R. (2019). The circular economy: A user's guide. Routledge.
7. Jonker, J. (2014). New business models: From linear to circular. Universiteit Utrecht.
8. Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. Strategic Management Journal, 28(13), 1319–1350. <https://doi.org/10.1002/smj.640>
9. Christensen, C. M. (1997). The innovator's dilemma. Harvard Business School Press.
10. Senge, P. M. (1990). The fifth discipline: The art and practice of the learning organization. Doubleday.
11. Ellen MacArthur Foundation. (2016). Intelligent assets: Unlocking the circular economy potential. Ellen MacArthur Foundation.
12. Schwab, K. (2016). The fourth industrial revolution. World Economic Forum.
13. Геєць, В. М. (2009). Суспільство, держава, економіка: феноменологія взаємодії та розвитку. НАН України.
14. Чухно, А. А. (2003). Постіндустріальна економіка: теорія, практика та їх значення для України. Логос.
15. Федулова, Л. І. (2006). Інноваційна економіка. Либідь.
16. Амоша, О. І., Вишневський, В. П., & Zbarazska, Л. О. (2008). Концептуальні орієнтири промислової політики України. Економіка промисловості, (4), 3–21.
17. Пономаренко, В. С., Кизим, М. О., & Тищенко, О. М. (2008). Інновації: проблеми науки та практики. ФОП Александрова К.М.; ІНЖЕК.
18. Грішнова, О. А. (2001). Людський капітал: формування в системі освіти і професійної підготовки. Товариство Знання, КОО.
19. Апалькова, В. В. (2015). Концепція розвитку цифрової економіки в Україні. Економічний вісник Запорізької державної інженерної академії, (2), 9–13.
20. Гриценко, А. А. (2018). Цифровий розвиток економіки України. Економіка України, (5), 20–33.
21. Ілляшенко, С. М. (2003). Управління інноваційним розвитком: проблеми, концепції, методи. Університетська книга.
22. Прокопенко, О. В. (2008). Екологізація інноваційної діяльності: мотиваційний підхід. Університетська книга.
23. Сотник, І. М. (2016). Економічні механізми управління сталим розвитком та ресурсозбереженням. Університетська книга.
24. Васильців, Т. Г. (2021). Конкурентоспроможність підприємств. Ліга-Прес.
25. Андрєєва, Н. М. (2020). Циркулярна економіка: теоретичні аспекти, механізми та інструменти розвитку. ІПРЕД НАН України.
26. Хаустова, В. С. (2021). Цифрова трансформація економіки: тенденції та перспективи розвитку. Бізнес-інформ, (12), 56–65.

References

1. Schumpeter, J. A. (1934). The theory of economic development. Harvard University Press.
2. Schumpeter, J. A. (1942). Capitalism, socialism and democracy. Harper & Brothers.
3. Porter, M. E. (1985). Competitive advantage: Creating and sustaining superior performance. Free Press.
4. Chesbrough, H. (2003). Open innovation: The new imperative for creating and profiting from technology. Harvard Business School Press.

5. Tapscott, D. (1995). The digital economy: Promise and peril in the age of networked intelligence. McGraw-Hill.
6. Stahel, W. R. (2019). The circular economy: A user's guide. Routledge.
7. Jonker, J. (2014). New business models: From linear to circular. Universiteit Utrecht.
8. Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28(13), 1319–1350. <https://doi.org/10.1002/smj.640>
9. Christensen, C. M. (1997). The innovator's dilemma. Harvard Business School Press.
10. Senge, P. M. (1990). The fifth discipline: The art and practice of the learning organization. Doubleday.
11. Ellen MacArthur Foundation. (2016). Intelligent assets: Unlocking the circular economy potential. Ellen MacArthur Foundation.
12. Schwab, K. (2016). The fourth industrial revolution. World Economic Forum.
13. Heiets, V. M. (2009). Suspilstvo, derzhava, ekonomika: fenomenolohiia vzaiemodii ta rozvytku [Society, state, economy: Phenomenology of interaction and development]. NAN Ukrainy.
14. Chukhno, A. A. (2003). Postindustrialna ekonomika: teoriia, praktyka ta yikh znachennia dlia Ukrainy [Post-industrial economy: Theory, practice and their significance for Ukraine]. Lohos.
15. Fedulova, L. I. (2006). Innovatsiina ekonomika [Innovative economy]. Lybid.
16. Amosha, O. I., Vyshnevskiy, V. P., & Zbarazska, L. O. (2008). Kontseptualni oriientyry promyslovoi polityky Ukrainy [Conceptual guidelines of industrial policy of Ukraine]. *Ekonomika Promyslovosti [Economy of Industry]*, (4), 3–21.
17. Ponomarenko, V. S., Kyzym, M. O., & Tyshchenko, O. M. (2008). Innovatsii: problemy nauky ta praktyky [Innovations: Problems of science and practice]. FOP Aleksandrova K.M.; INZHEK.
18. Hrishnova, O. A. (2001). Liudskiy kapital: formuvannia v systemi osvity i profesii noi pidhotovky [Human capital: Formation in the system of education and professional training]. Tovarystvo Znannia, KOO.
19. Apalkova, V. V. (2015). Kontseptsiiia rozvytku tsyfrovoy ekonomiky v Ukraini [The concept of development of the digital economy in Ukraine]. *Ekonomichnyi Visnyk Zaporizkoi Derzhavnoi Inzhenernoi Akademii [Economic Bulletin of Zaporizhzhia State Engineering Academy]*, (2), 9–13.
20. Hrytsenko, A. A. (2018). Tsyfrovyy rozvytok ekonomiky Ukrainy [Digital development of the economy of Ukraine]. *Ekonomika Ukrainy [Economy of Ukraine]*, (5), 20–33.
21. Illiashenko, S. M. (2003). Upravlinnia innovatsiinym rozvytkom: problemy, kontseptsii, metody [Management of innovative development: Problems, concepts, methods]. Universytetska knyha.
22. Prokopenko, O. V. (2008). Ekolohizatsiia innovatsiinoi diialnosti: motyvatsiinyi pidkhid [Ecologization of innovative activity: A motivational approach]. Universytetska knyha.
23. Sotnyk, I. M. (2016). Ekonomichni mekhanizmy upravlinnia stalym rozvytkom ta resursoszberezhenniam [Economic mechanisms of management of sustainable development and resource saving]. Universytetska knyha.
24. Vasylytsiv, T. H. (2021). Konkurentospromozhnist pidpriemstv [Competitiveness of enterprises]. Liha-Pres.
25. Andrieieva, N. M. (2020). Tsyrkuliarna ekonomika: teoretychni aspekty, mekhanizmy ta instrumenty rozvytku [Circular economy: Theoretical aspects, mechanisms and tools of development]. IPREED NAN Ukrainy.
26. Khaustova, V. Ye. (2021). Tsyfrova transformatsiia ekonomiky: tendentsii ta perspektyvy rozvytku [Digital transformation of the economy: Trends and prospects of development]. *Biznes-Inform [Business Inform]*, (12), 56–65.

Стаття надійшла до редакції / Received 05.05.2026
Опубліковано / Published 31.05.2026

Прийнята до друку / Accepted 18.05.2026