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**Improving intellectual capital management mechanisms in the context of
dynamic digital transformation of the global market environment**

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Abstract. The study's relevance stems from the strengthening of the role of intellectual capital as a key resource for enterprise competitiveness in the context of digital transformation, military challenges, the migration of specialists and rapid technological changes. In such conditions, traditional approaches to intellectual capital management, focused mainly on developing human resources or



implementing individual digital tools, do not provide a holistic framework for managing knowledge, competencies, client data and innovations. The **purpose** of the article is to substantiate the theoretical and methodological principles for improving the mechanism for managing an enterprise's intellectual capital by forming a digital ecosystem that integrates its components into a single strategic development contour. The **methodological basis** of the study is the systemic, comparative, structural-logical and generalizing approaches. The paper analyzes scientific views on the essence, structure and mechanisms of intellectual capital management and compares models of its formation in Ukraine and worldwide. **Results.** The need to transition from fragmented management of individual components of intellectual capital to a holistic mechanism is substantiated. The author proposes a structural and logical scheme for the digital ecosystem of intellectual capital management in an enterprise and identifies directions for improving mechanisms for managing its components within a single strategic contour. Human capital is considered in terms of its traditional and resilient components, which significantly expand the basic ideas about its role and influence in the formation and development of intellectual capital. The traditional interpretation of client capital is translated into the plane of brand reputation formation and building personalized interaction, and technological innovations and organizational capital are defined as the basis for integrating all elements of intellectual capital into a single mechanism. The practical significance of the work lies in the possibility of using the proposed digital ecosystem to improve the mechanisms for managing intellectual capital of enterprises by integrating human, client and organizational capital, technological innovations and brand reputation into a single contour of strategic development using digital tools, the capabilities of professional communities and personalized communication of social platforms. **Conclusions.** The results obtained provide grounds to conclude that the digital ecosystem can be regarded as an improved mechanism for intellectual capital management, ensuring the coordinated interaction of its components and enhancing



enterprises' adaptability to digital transformation and external environmental instability.

Keywords: intellectual capital, management mechanism, resilience, strategic competitiveness contour, digital ecosystem.

Удосконалення механізмів управління інтелектуальним капіталом в умовах динамічної цифрової трансформації світового ринкового середовища

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Анотація. Актуальність дослідження зумовлена посиленням ролі інтелектуального капіталу як основного ресурсу конкурентоспроможності підприємства в умовах цифрової трансформації, воєнних викликів, міграції фахівців та швидкої зміни технологічного середовища. У цьому контексті традиційні підходи до управління інтелектуальним капіталом, орієнтовані



переважно на розвиток людських ресурсів або впровадження окремих цифрових інструментів, не забезпечують цілісного управління знаннями, компетентностями, клієнтськими даними й інноваціями. **Метою статті** є обґрунтування теоретико-методичних засад удосконалення механізмів управління інтелектуальним капіталом підприємства через формування цифрової екосистеми, що інтегрує його окремі компоненти в єдиний стратегічний контур розвитку. **Методичну основу** роботи становлять системний, порівняльний, структурно-логічний та узагальнювальний підходи. У дослідженні проаналізовано наукові погляди на встановлення сутності, структури й механізмів управління інтелектуальним капіталом, здійснено порівняння моделей його становлення в Україні та світі. **Результати.** Обґрунтовано необхідність переходу від фрагментарного управління окремими елементами інтелектуального капіталу до цілісного механізму. Запропоновано авторську структурно-логічну схему цифрової екосистеми управління інтелектуальним капіталом підприємства й окреслено напрями вдосконалення механізмів управління його компонентами в єдиному стратегічному контурі. Людський капітал трактовано з позиції традиційних і резильєнтних аспектів, що значно розширює базові уявлення про його роль і вплив на формування та розвиток інтелектуального капіталу. Традиційне тлумачення клієнтського капіталу спрямовано на створення репутації бренду й побудову персоналізованої взаємодії, а технологічні інновації та організаційний капітал визначено як базис для інтеграції всіх елементів інтелектуального капіталу в єдиний механізм. Практична значущість роботи полягає в можливості використання запропонованої цифрової екосистеми для вдосконалення механізмів управління інтелектуальним капіталом підприємств через інтеграцію людського, клієнтського й організаційного капіталів, технологічних інновацій і репутації бренду в єдиний контур стратегічного розвитку із застосуванням цифрових інструментів, спроможностей професійних спільнот та персоналізованої комунікації соціальних платформ.



Висновки. Отримані результати дають підстави стверджувати, що цифрову екосистему можна розглядати як форму вдосконалення механізмів управління інтелектуальним капіталом, здатну забезпечити узгоджену взаємодію його компонентів і підвищити адаптивність до умов цифрової трансформації та нестабільності зовнішнього середовища.

Ключові слова: інтелектуальний капітал, механізм управління, резильєнтність, стратегічний контур конкурентоспроможності, цифрова екосистема.

Problem statement. The digital transformation of the global market environment significantly changes the operating conditions of Ukrainian enterprises and actualizes the need to find new ways to maintain and strengthen their competitiveness in the national and global markets. Digitalization not only contributes to the renewal of enterprise management processes and the introduction of modern information systems, platforms and automated solutions, but also transforms approaches to ensuring competitiveness, interaction with consumers and substantiation of management decisions. Unlike the traditional economy, where competitive advantages depended on physical assets, access to material and financial resources, and distribution channels, in the digital environment intangible resources take on special importance. The most important of them are the professional knowledge of personnel, digital skills, the ability to work with data, the company's reputation and the quality of interaction with customers, that is, the elements of intellectual capital.

Intellectual capital is an important factor in the development of an enterprise and in strengthening its market positions. However, in practice, intellectual capital management is often fragmented and unsystematic, as companies focus on certain aspects of it, while others remain out of focus. Another problem is the inability to transform employees' knowledge and experience into a real management resource. Therefore, the main task of improving intellectual capital management mechanisms



is to create a system that can accumulate knowledge, develop digital competencies and quickly adapt to changes.

Analysis of recent research and publications. In modern scientific literature, intellectual capital research is developing in several interrelated directions.

The first direction concerns the disclosure of the essence, structure and components of intellectual capital. Within this approach, intellectual capital is considered a set of human, organizational, client and innovation resources that form the basis for an enterprise's development and intangible potential. In particular, T. Husakovska, L. Sviatnyi [1], P. Syniehub, S. Kozlovskiy [2], N. Magas, O. Chabaniuk and I. Bernatska [3] focus on the structure of intellectual capital, its elements and the role of knowledge, professional competencies and experience of personnel in the formation of the intellectual potential of the enterprise. The second area of research focuses on the impact of digitalization, artificial intelligence, automated systems and digital platforms on the processes of formation and use of intellectual capital. Thus, L. Yatsemyrskiy [4], S. Fimiar and O. Hlemytskyi [5], P. Tkachenko [6] emphasize that digital technologies change not only management tools, but also methods of accumulation, processing, transfer and practical application of knowledge. The scientist N. Ilchenko [7] complements this approach, emphasizing the role of professional communities as a medium for exchanging experience, spreading knowledge and increasing the effectiveness of enterprises. This provides grounds for arguing that, in the context of digital transformation, intellectual capital goes beyond the purely personnel level and is formed through the interaction of human, organizational and digital resources.

The third direction concerns the understanding of intellectual capital as a strategic resource for an enterprise's competitiveness. The articles by P. Volkov [8], V. Doroshenko [9], V. Lahodiienko, O. Bohdanov, A. Chevtaiev [10], A. Ramskiy, P. Simavin [11] and H. Tarasiuk [12, 13] outline the role of intellectual capital in increasing an enterprise's adaptability, strengthening its innovativeness, flexibility



of business processes and ability to respond to changes in the external environment. It is in these works that intellectual capital is treated not only as an internal resource of an enterprise, but as a factor in the formation of its long-term competitive advantages.

A separate area of scientific research concerns the connection between intellectual capital and the innovative development of individual sectors of the economy. The works of O. Levit [14], S. Bilous [15], I. Cherniavskiy [16] considers the impact of digitalization, innovation and intellectual potential on improving the performance of enterprises across various sectors of the national economy. These works emphasize that the effective use of knowledge, competencies, technologies and innovative solutions is an important condition for the strategic development of an enterprise.

The generalization of the above approaches shows that modern research creates a theoretical basis for the analysis of intellectual capital.

Identification of previously unresolved parts of the general problem.

Despite significant attention to intellectual capital, the mechanisms for its holistic management in the context of digital transformation remain insufficiently substantiated. Most studies separately consider the development of human capital, digitalization of business processes, knowledge management, customer experience, and innovation. However, these areas are not always combined into a single system, which complicates the transformation of accumulated knowledge, skills and data into a strategic resource of the enterprise. The problem becomes particularly relevant for Ukrainian companies in the context of war and its consequences associated with personnel migration, loss of human potential, cyber threats and the need for rapid adaptation to changes.

Formulation of the article objectives (task statement). The purpose of the article is to substantiate the theoretical and methodological principles of improving the mechanisms for managing the intellectual capital of the enterprise on the basis of an integrated digital ecosystem, which combines its structural elements in a single



management framework and takes into account the impact of digital transformation, military challenges and the need for rapid adaptation during changes in the external environment. To achieve the set goal, it is necessary to clarify the content of the intellectual capital of the enterprise in the conditions of digital transformation; to determine the features of its formation in the Ukrainian business environment; to justify the transition to integrated mechanisms for managing its components and to develop a structural-logical model of the digital ecosystem of intellectual capital management of the enterprise.

Presentation of the main material of the study. Intellectual capital of an enterprise in the context of digital transformation should be considered as an integrated system of intangible resources that ensures the creation, accumulation, digital consolidation, preservation, use and updating of knowledge. Unlike the traditional approach, within which intellectual capital is often identified with human potential, the modern digital environment requires a broader understanding of it. Intellectual capital includes not only the knowledge, experience and competencies of employees, but also organizational procedures, digital infrastructure, client data, innovative solutions, brand reputation and the enterprise's ability to transform these resources into management solutions and competitive advantages. Thus, human capital is a source of knowledge creation; organizational – determines their consolidation in business processes, regulations and corporate culture; client – reflects the ability of the enterprise to build trust, loyalty and personalized interaction with consumers; innovative – transforms knowledge into new products, technologies and business models; digital – provides the technological basis for preserving, processing, protecting and scaling intellectual resources.

The formation and development of intellectual capital in Ukraine occur under specific conditions that significantly distinguish the Ukrainian experience from that of countries with developed market economies. On the one hand, Ukraine has a high level of education among its population and significant human potential; on the other hand, it faces insufficient commercialization of knowledge, as evidenced by a



limited number of patents, licenses, startups and innovative products [17, 18, 19]. Such a contradiction indicates the presence of a significant intellectual resource that requires more effective mechanisms to translate into economic results.

Despite the war-induced crisis, Ukraine is experiencing active development of state digital services, the transition of businesses to the cloud, and the preservation of the IT sector's high stability. This contributes to the formation of digital capital, which is based not only on technological solutions, but also on adaptability, resilience to stressful situations and the ability of enterprises to quickly restructure management processes.

A feature of the Ukrainian business environment is the mass migration of specialists, which has led to the phenomenon of remote intellectual capital. This is when a significant part of workers outside the country remains integrated into the Ukrainian economy through remote employment, participation in projects, professional communities and digital forms of cooperation.

In addition, the development of Ukrainian enterprises' intellectual capital is influenced by the strengthening of the military-tech direction, which combines engineering, digital, management and innovation knowledge. The creation and rapid testing of technological solutions in the areas of security, communications, logistics, data analytics and automated systems contribute to the accumulation of practical experience, strengthening the innovative potential of enterprises and the spread of technological solutions to related sectors of the economy.

According to the Global Innovation Index 2024 [19], Ukraine demonstrates higher innovation efficiency in terms of the volume of invested resources than many developed countries. This proves that the main driver of development is not investment, but intellectual potential and digital adaptability. In the National Cyber Security Index [20], Ukraine ranks 19th, indicating the development of a unique structural capital that can operate under constant cyber threats, which is critically important for digital transformation during war. The results of the Global Skills Report for 2024 also indicate the formation of digital competencies in the Ukrainian



professional environment, the ability to solve complex technical tasks and create new design solutions [21, p. 29]. This provides grounds for arguing that the development of intellectual capital in Ukraine is largely related to enterprises' needs to adapt to crisis situations, preserve knowledge and use digital tools to support managerial stability.

Taken together, these factors confirm that the Ukrainian conditions for the formation of intellectual capital have a distinct resilient orientation and require management mechanisms capable of ensuring the preservation, development and practical application of knowledge in times of instability.

For a deeper understanding of the differences in the formation of intellectual capital, it is advisable to compare its main components across developed markets and the Ukrainian business environment (table 1).

Table 1

Characteristics of intellectual capital components in the context of digital transformation: global and Ukrainian contexts

Component	Countries with developed markets	Ukraine
Human capital	Systemic learning, long-term investments in professional improvement, narrow specialization and development of soft skills	High adaptability, multitasking, forced mobility, remote employment, crisis competencies
Organizational capital	Stable digital infrastructure, regulated business processes and developed management automation systems	Flexible digital solutions, cloud services, cyber resilience and rapid restructuring of management processes
Customer (market) capital	Long-term loyalty, stable brands and use of big data for customer experience management	24/7 digital interaction, online trust, personalized communication
Innovative capital	Planned development of research, government grants, intellectual property protection and long-term innovation programs	Innovations in the military-tech sector, rapid testing of solutions and focus on practical results



Component	Countries with developed markets	Ukraine
Digital capital	High capitalization of proprietary software products, licensed solutions and digital platforms	Priority on data protection and resilience to cyberattacks, use of cloud technologies, open digital solutions and artificial intelligence tools

Source: compiled by the authors based on [1–3, 17–21]

The analysis of the characteristics presented in table 1 shows that the difference in the Ukrainian context lies not so much in the structure of intellectual capital, but rather in the methods of its formation and use. In developed markets, human, organizational, innovative, client and digital capitals exist mainly under conditions of stable institutional support, long-term investments and a predictable external environment. In Ukraine, they are formed under high uncertainty and acquire an adaptive, crisis-resistant character.

Characteristics of intellectual capital development in Ukraine necessitate improving its management mechanisms by coordinating knowledge, competencies, digital tools, client data and other components with the enterprise's strategic goals. The content of such improvement consists of the transition from separate management of individual elements of intellectual capital to their combination into a single management cycle.

It is advisable to consider the enterprise's intellectual capital management mechanism as a set of goals, principles, functions, tools and digital solutions aimed at the creation, development and preservation of intellectual resources. Its subjects are the company's management, functional units, innovation teams, IT specialists and customer service units (marketing, service, sales). The objects of management are human, organizational, customer, innovation and digital capital, as related components of the enterprise's intellectual capital. It is this logic that underlies the digital ecosystem proposed in fig. 1, which involves the interaction of two framework.



The outer framework reflects the most important components of intellectual capital, which shape its content and determine the company's strategic potential. Each of them performs a separate function, but their effectiveness depends on the enterprise's ability to establish their relationships within a single management system.

The internal digital framework performs an integration function and ensures practical interaction of the components of the external framework. The elements that make up the internal framework create a technological basis for digital consolidation, storage, processing and use of knowledge in the process of enterprise management. The presence of a digital framework enables the transformation of individual components of intellectual capital into an interconnected management system. Knowledge and competencies formed within human capital are recorded in knowledge bases, CRM systems and digital platforms. Customer data is used for analytics, personalization of interactions and support for management decision-making. Innovative projects are based on accumulated experience, digital tools and analysis results. Organizational capital involves streamlining these operations through regulations, business processes and organizational memory.

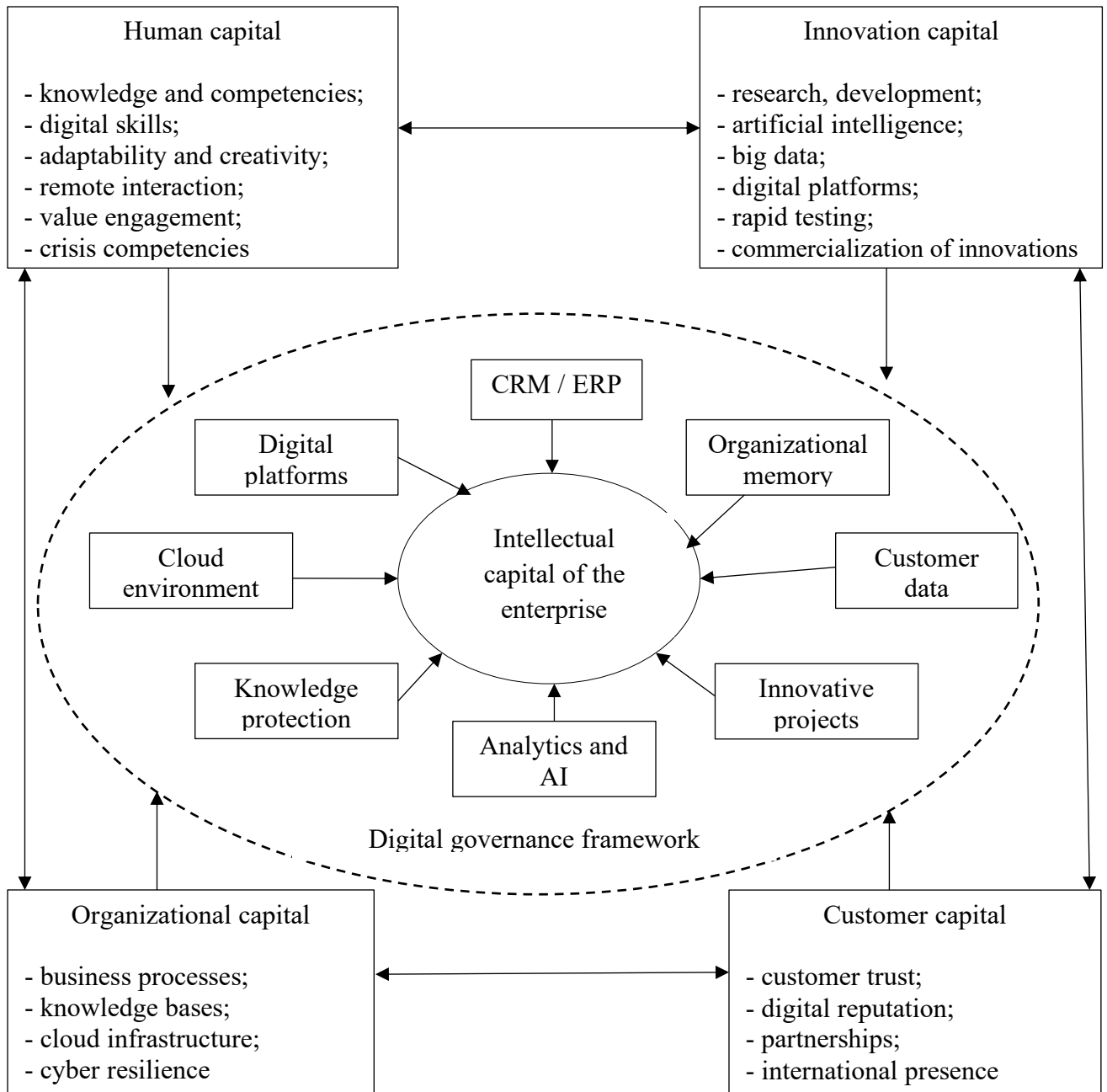


Fig. 1. Structural and logical model of the digital ecosystem of intellectual capital management of the enterprise

Source: authors' development

The interaction between the external and digital framework builds a holistic mechanism for intellectual capital management, within which knowledge is not only created but also stored, distributed and transformed into innovative solutions and competitive advantages for the enterprise.



Human capital is of particular importance in the proposed digital ecosystem, since it is the primary source of knowledge creation, professional competencies and innovative ideas. In the context of digital transformation, human capital should be considered not only through traditional characteristics – education, skills, competencies, creativity [4], but also through resilient characteristics that determine the ability of personnel to act in conditions of uncertainty.

This approach expands the traditional understanding of human capital and actualizes the importance of components focused on stability and adaptability.

The digital contour of the specified ecosystem includes digital CRM and ERP management systems, cloud services, knowledge bases, big data technologies, analytics tools and artificial intelligence. Their use ensures digital preservation, processing, development and practical application of knowledge in the process of making management decisions. At the same time, digital tools perform not an auxiliary, but an integration function, since they combine all elements of intellectual capital into a single strategic management contour.

The innovative component of intellectual capital transforms accumulated knowledge into practical results of the enterprise's activities. It is not only about implementing individual technological solutions, but also about the company's ability to systematically leverage intellectual resources to drive innovation. Within the proposed digital ecosystem, the innovative component connects all elements of intellectual capital. Therefore, improving the mechanism of its management, which concerns innovation, involves transitioning from episodic introduction of new technologies to a continuous innovation cycle. It includes identifying knowledge and skills that can be applied to the development of the enterprise; assessing digital and organizational readiness for change; testing innovations, their integration into business processes; analyzing results and further accumulating experience.

This approach is consistent with scientific positions on the need for the systematic implementation of technologies [22, p. 8–9]; however, it is not a separate



algorithm for innovative development but part of a holistic mechanism for managing the enterprise's intellectual capital.

Therefore, innovative capital within the proposed ecosystem serves as the practical transformation of existing knowledge across all areas into new products, management solutions, technologies and business models.

One of the most important intangible resources of an enterprise is customer capital, which has been formed in recent decades through various means and sources. If in the late 90s of the twentieth century, and at the beginning of the twenty-first century. Its basis was product quality, supply stability, trust in the manufacturer, personal contacts, recommendations and traditional channels of communication. Today, the main environment for the formation of customer capital is digital social platforms that provide content personalization, digital interaction, rapid information exchange and constant audience feedback [23]. In addition, brands are increasingly actively involving users in creating their own content, participating in surveys, competitions, discussions and thematic online communities. As a result, customer capital develops through the consumer's constant digital interaction with the brand. An important role in this process is played by the brand's reputation, which is based on clear positioning, a consistent tone of voice, open communication, and the quality of content. In the proposed digital ecosystem of intellectual capital management, client capital becomes a dynamic digital resource formed through personalized communication, client data, online reputation and constant feedback.

The last element that ensures the functioning of the digital ecosystem is organizational capital. If human capital creates knowledge, technologies provide for its digital processing and practical application, and client capital transforms the results of the enterprise's activities into trust and loyalty, then the task of organizational capital is to streamline, preserve and reproduce these processes within the enterprise.

The elements of organizational capital are internal regulations, business processes, management procedures, corporate culture and internal communications



system, knowledge bases and work standards, which form the mechanism for transforming individual employee knowledge into a systemic resource for the enterprise. The advantage of such a resource is that it is not lost during personnel changes, scaling of activities or transformation of the business model. During the period of digital transformation, organizational capital ensures consistency across all components of the digital ecosystem and transforms employees' individual knowledge into a sustainable management resource for the enterprise.

Conclusions. As a result of the study, the enterprise's intellectual capital content in the context of digital transformation was clarified. It was determined that the conditions for the formation of intellectual capital in Ukrainian companies differ from those in countries with developed market economies. If, in world practice, the development of intellectual capital is mainly supported by systemic state policy, investments, and innovative infrastructure, then in Ukraine, it is largely formed as a tool for adapting to crisis challenges. As a result, intellectual capital in Ukraine becomes not only a set of intangible resources but also the basis for enterprises' resilience.

It is substantiated that the traditional approach to intellectual capital management needs to be revised, as it is reduced mainly to the development of human capital or the implementation of individual digital tools and does not fully account for the connections among all components in modern conditions. Therefore, improving the mechanisms of intellectual capital management consists of moving from fragmented management of individual elements to the creation of a holistic digital ecosystem.

A structural and logical scheme for a digital ecosystem of intellectual capital management is proposed, combining human, organizational, client, innovative and digital capital within a single management architecture. The interaction of these elements forms a single framework of strategic development, enabling the creation, accumulation, digitization and transfer of knowledge that is transformed into innovations and can be used to strengthen the enterprise's long-term



competitiveness. The scientific significance of this approach is that the digital ecosystem is considered an improved management mechanism capable of ensuring the interaction among all elements of intellectual capital.

Prospects for further research include developing quantitative indicators to assess the proposed digital ecosystem for intellectual capital management, as well as determining the impact of its components on innovative activity, the commercialization of knowledge and the enterprise's competitiveness.

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