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BUILDING STRATEGIC RESILIENCE THROUGH THE INTEGRATION OF CREDIT MANAGEMENT, INNOVATION DEVELOPMENT, AND RISK MANAGEMENT FOR STRATEGIC ENTERPRISE MANAGEMENT IN THE DIGITAL ECONOMY

The object of research is the process of strategic enterprise management in the digital economy, encompassing digital credit management, innovation development, and risk management as interconnected components of ensuring strategic resilience. The absence of an integrated approach that combines credit management, innovation development management, and risk management into a unified system for ensuring strategic resilience, as well as the lack of a quantitative assessment framework, constituted the research problem addressed in this research. To ensure the comparability of indicators, the research employed the Min-Max normalization method, the entropy method to determine weighting coefficients, and an integral assessment based on the construction of the Digital Strategic Management Index. The findings revealed significant differences in the level of strategic management among enterprises across EU countries. Specifically, the highest values of the integral index were recorded for Denmark (0.930), Finland (0.899), and Sweden (0.849), whereas Bulgaria demonstrated the lowest value (0.002). It was found that the use of artificial intelligence technologies and investments in research confirming their importance for ensuring the strategic resilience of enterprises exert the greatest influence on the formation of the integral index. A conceptual and methodological approach to strategic enterprise management was proposed in the form of the Digital Strategic Resilience Framework, which integrates digital credit management, innovation development management, and risk management into a unified management system. The combination of the proposed framework with the integral index constitutes the key novelty of the research results. The obtained results can be applied by enterprises to assess the implementation of digital transformation strategies, improve digital credit management, enhance innovation activities, and strengthen risk management.

Keywords: *strategic management, digital economy, resilience, credit management, innovation management.*

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1. Introduction

The functioning of enterprises in the digital economy has new features. Under such features, the strategic advantages of the enterprise are determined by the availability of financial resources and production potential. At the same time, they largely depend on the ability of the enterprise to quickly adapt to technological changes, to use digital data in a timely and effective manner, and to respond promptly to the challenges of the business environment. Modern trends associated with the rapid development of artificial intelligence, big data (Big Data), cloud technologies, digital platforms, automated management systems, and financial technologies have a significant impact on traditional business models. As a result, approaches to the formation of a long-term development strategy for enterprises are changing. But such changes directly affect the complexity of management processes, which is manifested in the growth of cyber risks, increased financial instability, increased dynamics of technological changes, increased global competition, transformation of consumer behavior patterns, and the need for continuous innovation. In accordance with these conditions, strategic management can no longer be based only on long-term planning. The strategic resilience of the enterprise comes to the fore, that is, the ability of the enterprise to predict potential threats, to be able to adapt to changes, to maintain the stability of business processes, to transform crisis phenomena into a source of development and the formation of competitive advantages.

The strategic resilience of the enterprise requires a comprehensive approach that combines interrelated areas of enterprise management. These include digital credit management. Its main task is to ensure the maintenance of financial stability through the use of digital technologies to assess competitiveness, manage financial flows, forecast risks and make informed financial decisions. The second important area is the management of innovative development, which ensures the implementation of digital technologies, the modernization of business processes, the development of innovative potential and the growth

of the enterprise's competitiveness. At the same time, these processes depend on the risk management system, which takes into account financial, operational, technological, cyber, information and strategic risks.

Therefore, strategic management of an enterprise in the digital economy should be considered as an integrated system that combines digital credit management, innovative risk management and risk-oriented management. These components are interconnected, do not function in isolation, ensure the strategic resilience of the enterprise, its financial stability and ability to develop in the face of constant change. Despite significant scientific achievements in the field of digital transformation of enterprises, innovation management, credit management and risk management, these areas are analyzed separately by modern researchers. The theoretical and methodological principles of their integration into a single strategic management system, which is oriented towards ensuring the strategic resilience of the enterprise in the digital economy, have not yet been fully explored. Accordingly, there is a need to form a comprehensive concept that will include financial, innovative and risk-oriented mechanisms within the framework of the digital development strategy of the enterprise.

One of the directions is the research of digital transformation of enterprises and its impact on strategic management. The work [1] characterizes digital business strategy as a new stage in the development of strategic management, when digital technologies become the basis for the formation of competitive advantages. However, this approach reflects the strategic role of digital resources and does not reveal the mechanisms of interaction with either financial support or risk management. The vision of digital transformation as complex changes in business models, organizational processes, corporate cultures and value creation mechanisms is studied in the works [2, 3]. At the same time, the issue of ensuring strategic resilience under the influence of these transformations has not been developed. Also, financial and risk-oriented mechanisms are not considered within the framework of the proposed concepts. This makes it impossible to use them to build an integrated system of strategic management of the enterprise. The following researches are related to the development of the concepts of dynamic capabilities and strategic resilience of enterprises. Research [4] investigated how long-term competitiveness depends on the ability of an enterprise to integrate, change and update its own competencies with changes in the external environment. This vision was formed even before the spread of digital technologies, according to which the specifics of the digital environment and the risks associated with it were not taken into account. In work [5], the dynamic capabilities of the enterprise are considered in the context of digital business transformation. Attention is paid to organizational adaptation without substantiating the financial mechanisms for its provision.

In works [6, 7], organizational resilience is determined through the ability of the enterprise to predict crisis phenomena, adapt to them and resume operations. However, these researches did not form a toolkit that would allow linking the development of resilience with digital credit management, innovative activities and digital risk management within a single strategic management system.

The next area of research is related to digital finance and digital credit management. The research [8] proved the positive impact of the development of digital finance on corporate resilience by simplifying enterprises' access to financial resources and reducing the cost of financing. The authors proved that expanding access to external financing and reducing its cost contribute to reducing losses of enterprises and accelerating their recovery from crisis events. In the work, digital finance is not considered as a component of an integrated strategic management system.

These results are confirmed in the research [9], which emphasizes the positive relationship between digital finance, digital transformation of enterprises and their performance. However, the research focuses mainly on ESG results and does not reveal the mechanism of interaction of digital financial provision with innovative development and risk management in the process of forming strategic resilience.

The report [10] considers practical mechanisms of financial support for the private sector in crisis conditions, in particular, expanding enterprises' access to financing and supporting financial institutions and supply chains. However, the applied nature of the report does not provide a theoretical justification for the place of digital credit management in the strategic management system of the enterprise.

Thus, the results of [8–10] confirm the importance of financial accessibility and digitalization of financial mechanisms for the sustainability and development of enterprises, but do not form a holistic approach to the integration of digital credit management, innovative development and risk management. It is their interaction in the process of forming the strategic resilience of the enterprise that remains insufficiently studied.

The following researches concern the innovative development of enterprises in the digital economy. They prove that digital technologies, artificial intelligence, cloud and digital platforms are the basis for the formation of the innovative potential of enterprises. In [11] it is proven that digital transformation stimulates the development of new business models and has a positive effect on the adaptability of enterprises. At the same time, innovative development increasingly depends on the scale of investment in research, on the use of modern digital technologies, on the development of digital competencies of personnel.

At the same time, the authors pay considerable attention to the organizational and managerial prerequisites of digital transformation. But its relationship with the financial support of innovations and risk management are not considered in this research. Such an approach significantly limits the use of the proposed approach in the context of explaining the formation of strategic resilience as a result of the interaction of financial, innovative and risk-oriented mechanisms.

The next direction covers the research of risk-oriented management. In [12], the integration of a risk-oriented approach into the system of strategic management accounting and management decision-making is emphasized.

The work focuses on the accounting and analytical support of risk management and its relationship with credit management and innovative development of the enterprise. The research [13] considers a comprehensive approach to risk management and its relationship with the strategic conclusions of the enterprise. However, this approach does not take into account the specifics of the digital environment, such as new types of risks and the potential for using digital technologies to predict and monitor them. Thus, the results obtained in [12, 13] serve as a theoretical basis for integrating risk management into the strategic management system. However, the issue of its systematic combination with digital credit management and innovative development management in the process of forming the strategic resilience of the enterprise is not resolved.

Thus, the analysis of the literature allowed to identify the presence of scientific gaps in the areas studied. The first drawback is associated with the research of digital credit management, innovative development and risk-oriented management in isolation from each other, without taking into account their interaction in the process of strategic management of the enterprise. Secondly, the issues of forming the strategic resilience of the enterprise based on the integration of these components have not been sufficiently studied. Thirdly, in modern scientific thought there are practically no methodological approaches to quantitatively assessing the level of strategic management of the enterprise, which would take into account the level of digitalization, the level of innovative activity and the level of digital risk management.

The object of research is the process of strategic management of the enterprise in the conditions of the digital economy, which includes digital credit management, innovative development and risk management as interrelated components of ensuring strategic resilience.

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The subject of research is the theoretical and methodological principles, tools and mechanisms for integrating credit management, innovative development management and risk management into the system of strategic management of the enterprise.

The aim of research is to develop an approach to the formation of strategic enterprise management in the digital economy by integrating digital credit management, innovative development management and risk management.

To achieve this aim, the following objectives are envisaged:

– to substantiate the theoretical foundations of strategic enterprise management in the digital economy and to determine the role of digital credit management, innovative development and risk management in the formation of the strategic resilience of the enterprise;
– to develop a conceptual model of the Digital Strategic Resilience Framework (DSRF), which integrates digital credit management, innovative development management and risk-oriented management into a single system of strategic enterprise management;
– to propose an integrated index of the level of strategic resilience of enterprises in the European Union countries by constructing an integrated index Digital Strategic Resilience Index and to identify areas for its improvement.

2. Materials and Methods

The research used a cross-sectional database of international comparable statistical data, which examined ten EU countries using official Eurostat information for the latest available years. The sample included the following countries: Denmark, Sweden, Finland, Belgium, the Netherlands, Germany, France, Italy, Poland and Bulgaria. These countries have different levels of digital transformation, innovative development and use of modern digital technologies. This is what provides the possibility of a comparative analysis of strategic enterprise management.

Official Eurostat statistical indicators were used to build an integrated assessment. These indicators characterize the key components of strategic enterprise management in the digital economy. These indicators are: the level of use of cloud technologies by enterprises (Cloud Computing), the level of use of artificial intelligence (Artificial Intelligence), the level of digital intensity of enterprises (Digital Intensity Index), research and development spending (GERD), and the implementation of measures to ensure cybersecurity (ICT Security). The combination of these indicators makes it possible to comprehensively assess the digital maturity of the enterprise, its innovative potential and ability to function in the digital economy.

In accordance with the set aim, the following hypotheses were formed and practically tested:

*H*1: the higher the level of use of digital technologies (cloud services and artificial intelligence), the higher the level of strategic management of the enterprise;

*H*2: for the formation of strategic resilience, one of the main factors is the innovative activity of enterprises, which is characterized by the intensity of research and development costs;

*H*3: a comprehensive combination of digital credit management, innovative development and risk-oriented management ensures effective strategic management of the enterprise and is reflected in the integral index Digital Strategic Resilience Index (*DSRI*).

As a research methodology, systemic, process and risk-oriented approaches were used. They contribute to considering strategic management of the enterprise as an integrated system of interaction of financial, innovative and management processes in the digital economy.

The theoretical basis of research is the provisions of the theory of digital transformation, the concept of strategic resilience and the provisions of the dynamic capabilities of the enterprise. Also, general scientific and special methods were used in the research process. In order to systematize scientific approaches to strategic management, digital credit management, innovative development management and risk management, the method of analysis and generalization was chosen. The research of the features of the digital transformation of enterprises in the EU countries was carried out using comparative analysis. The Min-Max normalization method was used to ensure the comparability of statistical indicators in order to bring them to a single dimensionless scale. The Entropy Weight Method, which is based on the assessment of the information saturation of indicators and minimizes the subjectivity of expert assessment, was used to objectively determine weight coefficients. The research concludes with the application of the integral assessment method by constructing the Digital Strategic Resilience Index (*DSRI*), which allowed ranking countries and performing a comparative assessment of the level of strategic management of enterprises.

The information base of research includes official Eurostat statistics [14]. These data ensure the international comparability of the indicators used. Official Eurostat statistics make it possible to ensure the reliability of the information base, methodological consistency of indicators, and the possibility of applying international comparisons.

The result of using the proposed methodological approach was the formation of an integrated Digital Strategic Resilience Index (*DSRI*), a comparative assessment of the level of strategic management of enterprises in the studied countries, identification of key factors in the formation of strategic resilience, and justification of practical recommendations for increasing the efficiency of digital credit management, innovative development, and risk-oriented management in the digital economy.

3. Results and Discussion

3.1. Theoretical principles of strategic management in the digital economy

Strategic management of an enterprise in the scientific literature was considered as the process of forming long-term goals of an enterprise in the context of determining the directions of its development and effective use of available resources in order to achieve competitive advantages. Classical approaches to strategic management are based on the assumption of relative stability of the external environment. This is what allowed the enterprise to form its long-term strategies taking into account predicted market changes, competitive analysis and resource potential [4].

The development of the digital economy has influenced and significantly changed the conditions for the functioning of enterprises. Features of the digital economy, such as the spread of digital technologies, artificial intelligence, big data (Big Data), cloud computing, financial platforms, financial technologies have influenced the growth of the speed of economic processes, increased the level of uncertainty and increased the number of risks. In such conditions, classical approaches to strategic management of an enterprise lose their effectiveness due to their orientation only on planning. The modern business environment requires constant adaptation to changes in the internal and external environment and adequate revision of management decisions [11].

The progress of the digital economy has changed the logic and content of strategic management of an enterprise. Previously, material resources, production facilities, access to financial capital determined the competitive advantages of an enterprise. Today, digital assets, information resources, analytical capabilities, and the speed of making management decisions come to the fore. Such a transition is based on the theory of dynamic capabilities, which assumes that the long-term competitiveness of an enterprise depends on its ability to integrate, form, and transform its competencies in accordance with rapid changes in the external environment [4]. The development of this concept in the digital economy was reflected in the research [5]. The paper states that digital transformation is not only the introduction of new technologies, but also a revision of business models, organizational processes, and mechanisms for creating advantages, as they ensure the ability of an enterprise

to adapt to changing market conditions. Therefore, the process of digitalization changes both the tools of enterprise management and the fundamental principles of forming and implementing the enterprise strategy. A comparative description of the differences between the traditional model of strategic enterprise management and modern strategic management in the digital economy is provided in Table 1.

Table 1

Transformation of strategic enterprise management in the digital economy (author's development)

Traditional strategic management of the enterprise	Strategic management of the enterprise in the digital economy
Orientation on long-term planning	Continuous adaptation of the strategy to external changes
Periodic analysis of the external environment	Real-time monitoring
Basis of decision-making – management experience and financial reporting	Data-driven management, Big Data, AI and Predictive Analytics
Key resources – tangible assets and financial capital	Digital assets, data, knowledge and digital competencies
Response to changes after their occurrence	Proactive forecasting and scenario modeling
Risk management is aimed at minimizing losses	Risk management integrated into strategic decision-making
Innovations are implemented as separate projects	Innovation is a component of the strategic development of the enterprise
The main goal is to ensure the competitive advantages of the enterprise	The main aim is to form strategic resilience and long-term competitiveness of the enterprise

Note: generalized based on [4, 5, 7]

Strategic management of an enterprise in the digital economy is transforming from static long-term planning to constant adaptation of the enterprise based on digital technologies, data analytics and the development of dynamic capabilities. However, in addition to new opportunities for increasing competitiveness, digital transformation is accompanied by the emergence of new challenges and risks, which necessitates the formation of strategic resilience of the enterprise as a basic characteristic of a modern strategic management system.

Along with this, digitalization generates new challenges for the enterprise. These challenges are associated with the growth of cyber risks, the presence of technological dependence, the possibility of digital fraud, the growth of information threats, the instability of global supply chains and high volatility of financial markets. This is what determines the need to transition from traditional strategic management to strategic management, which is focused on ensuring the stability of the enterprise in conditions of uncertainty.

Modern research focuses on the concept of strategic resilience, which implies the ability of an enterprise not only to resist the negative flow of the external environment, but also to consider changes as a source of new opportunities for the development of the enterprise. The concept of strategic resilience was first proposed in [15], where it was determined that the concept determines the ability of an enterprise to constantly update its business model and its strategy in response to changes in the external environment, and not only to recover after crisis events. In [15], these interpretations were supplemented by a combination of strategic resilience with the development of dynamic capabilities, organizational learning and innovative activity of enterprises. The difference in the traditional understanding of resilience is that it involves preserving the existing state of the system, while strategic resilience is oriented towards dynamic adaptation. Continuous learning, digital transformation and development of the enterprise's innovative potential.

In this research, the strategic resilience of an enterprise is considered as an integral ability of an enterprise to ensure its long-term competitiveness through the synchronization of digital credit management, innovative development management and risk-oriented management in the conditions of the digital economy. The difference of this approach from the existing ones lies in the combination of financial, innovative and managerial aspects into a single system of strategic development of the enterprise.

According to the proposed approach, digital credit management acts as a mechanism to support the financial stability of the enterprise. Innovative development management enables the enterprise to form the potential for long-term growth, provides technological renewal of business processes and creates new competitive advantages. The management function associated with minimizing losses is replaced by a system of constant monitoring, forecasting and formation of strategic management decisions in order to minimize risks based on the digital economy.

It can be noted that strategic management in the conditions of the development of the digital economy is an integrated system consisting of digital technologies, credit management, innovative development and risk management in order to ensure the resilience of the enterprise. This approach ensures the long-term competitiveness of the enterprise, ensuring its financial stability and effective functioning under the influence of changes in the external environment.

Creating conditions for the formation of strategic resilience of an enterprise in the digital economy directly depends on the effectiveness of financial resource management, the ability of the enterprise to attract credit capital, the possibilities of innovative development, and the adaptation of the enterprise to changes in the external environment. Accordingly, credit management is transformed from a functional component of financial management into a strategic tool for ensuring the long-term sustainability of the enterprise. The use of big data, digital platforms, predictive analytics, and intelligent management decision support systems expands the possibilities of making financial decisions for the enterprise [1, 2].

The research proposes to consider credit management as a system for managing the processes of attracting, using, controlling, and optimizing the enterprise's credit resources based on digital technologies, data analytics, and automated financial monitoring tools. The peculiarity of digital credit management is to perform a strategic function that provides an information basis for selecting sources of financing, assessing the credit load, forecasting financial risks, and supporting the enterprise's investment decisions. In contrast, the traditional approach focuses mainly on accounting for credit obligations and monitoring their timely repayment.

Digital changes in financial management are also changing the information base of credit management. In the digital economy, credit resource management is based on current operational data, digital financial services, cash flow analysis, and the status of electronic payments on digital platforms and forecasting tools. This trend allows for a quick assessment of the need to attract loan capital, determine the optimal financing structure, model liquidity scenarios, and monitor threats to financial stability. This corresponds to the understanding of digital transformation as a process that, together with changes in technological tools, also changes the management models of the enterprise [2, 3].

Digitalization changes the content of credit management by expanding its function of strategically ensuring the resilience of the enterprise and its financial stability. Table 2 shows the differences between traditional and digital approaches to credit management.

Analyzing Table 2, it is possible to conclude that credit management is gaining strategic importance and going beyond traditional credit resource management. Its main feature is the process of ensuring the financial stability of the enterprise based on digital technologies, data analytics and predictive models, which ensures an increase in the strategic resilience of the enterprise.

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Table 2

Comparison of traditional credit management and digital credit management in the digital economy by main areas

Main directions	Traditional credit management of the enterprise	Digital credit management of the enterprise
Aim	Providing the enterprise with credit resources	Ensuring financial stability and strategic resilience of the enterprise
Information base	Financial reporting, accounting data	Big Data, ERP, CRM, Open Banking, digital platforms
Approach to analysis	Retrospective analysis of activities	Predictive analytics and scenario modeling
Decision-making	Periodic, mainly expert	Data-driven, automated, real-time
Risk management	Reaction after problems arise	Early risk identification and preventive management
Role in the enterprise	Functions of financial management	Strategic management tool
Expected result	Maintaining the solvency of the enterprise	Financial stability, support for innovative development, financial resilience of the enterprise

Note: generalized based on [1–3]

Digital credit management has a significant impact on overcoming the financial constraints of the enterprise. As researches have shown, this occurs due to the reduction of financial barriers due to the reduction of information asymmetry. Increasing the transparency of the enterprise's activities and improving access to external financing [9]. Accordingly, digital financial instruments can act as a mechanism for expanding the financial capabilities of the enterprise, as the quality of communication with creditors, investors and other financial stakeholders increases.

Strategic resilience of the enterprise involves not only access to credit resources, but also the ability of the enterprise to use resources to support adaptability and development. In [8], it is stated that digital finance influences the increase of corporate resilience by facilitating access of enterprises to external financing and reducing the cost of financial resources. This illustrates the possibility of strengthening the ability of the enterprise to withstand external challenges, recover faster from crisis events, maintain the stability of strategic development through the digitalization of the financial environment.

At the same time, credit management is interrelated with the innovative development of the enterprise. Easing of financial constraints, increasing investment in research and development with the availability of digital financial instruments and the development of the digital financial environment can contribute to the activation of the innovative activity of the enterprise. In [16], it is proved that digital inclusive finance contributes to the development of digital technological innovations of the enterprise by reducing financial constraints. Thus, digital credit management is considered as a mechanism of financial support of the innovation strategy of the enterprise.

Along with the development of digitalization of credit management, new risks appear. First of all, these are cybersecurity risks, loss or distortion of financial data, dependence on digital platforms, errors in automated systems, insufficient data quality and opacity of algorithmic solutions. For the effective use of digital credit management, in addition to technological updating of financial processes, it is necessary to develop corporate data management, internal control systems, digital competences of personnel and a mechanism for risk-oriented financial monitoring.

Thus, the place of digital credit management as the basis of strategic management of an enterprise in the digital economy is confirmed, since it forms the financial basis of the adaptation process, innovative development and long-term sustainability. The strategic purpose of digital credit management is to perform the following functions. The financial function ensures the attraction and use of credit resources. The analytical function allows using digital data to provide support for management decisions. The resilience function ensures the ability of the enterprise to withstand risks and provides the opportunity to maintain the competitiveness of the enterprise. Thus, digital credit management acts as a basic tool for forming the strategic resilience of the enterprise.

One of the most important factors in the formation of strategic resilience of an enterprise in the digital economy is innovative development. In the current conditions of the development of the digital environment, innovations are already considered not only as a tool for updating products, technology or production processes, but are gaining strategic importance. It is innovative development that allows an enterprise to adapt to technological changes, the ability to form new business models, significantly increase the efficiency of management decisions and create additional competitive advantages [3, 5].

In the conditions of strategic resilience, innovations perform both the function of economic growth and the function of ensuring the enterprise's resilience to the influence of internal and external threats. Enterprises that have higher adaptability to crisis phenomena and technological changes systematically invest in research, digital technologies, and the development of digital competencies of personnel [7, 11].

The digital economy has a significant impact on the nature of an enterprise's innovative activity. It is the use of artificial intelligence, cloud technologies, big data, digital platforms, and automated management systems that allows for the formation of a continuous process of creating and implementing innovations. And this is what contributes to the fact that innovative development becomes part of the strategic management of an enterprise [2, 3].

One of the important characteristics of digital transformation is its impact on the financial and organizational structure of an enterprise. Digital analytics, predictive modeling, and automated decision support systems allow for increased resource efficiency, optimized business processes, and minimized uncertainty during the implementation of strategic decisions [1, 2].

Innovative development is closely related to digital credit management. The combination of digital financial technologies with modern mechanisms for financing innovation allows for the reduction of financial constraints, promotes investment in research and development, and accelerates the implementation of digital technologies. Innovative activity allows for the increase of the investment attractiveness of an enterprise and increases its financial stability [8, 9].

In the context of strategic management, innovative development performs the following interrelated functions: it contributes to the technological renewal of the enterprise, increases the productivity of business processes, ensures adaptability to changes in the external environment and contributes to the formation of long-term competitive advantages. These functions are associated with the ability of the enterprise to renew its own resources and competencies [4, 5].

Digital transformation, having a positive impact on innovation, is characterized by the emergence of new risks, such as cyber threats, technological dependence, the risk of data leakage, the risk of rapid obsolescence of digital technologies. This is what determines the need to integrate innovative development with a risk-oriented management system. Such integration should ensure a balance between technological renewal and monitoring and control of potential threats [3, 7].

Thus, it can be argued that innovative development in the digital economy should be considered as a strategic factor in ensuring the resilience of the enterprise. The role of innovative development is to

form the ability of the enterprise to constantly adapt, develop digital competencies, increase management efficiency and ensure long-term competitiveness [5, 11].

Risk management in the digital economy is becoming the main tool for ensuring the strategic resilience of the enterprise. This is due to the rapid development of technologies, digitalization of business processes, the rapid development of digital platforms, the spread of the use of artificial intelligence and big data. These processes create new risks in the activities of the enterprise. Financial, operational, market risks are supplemented by cyber risks, risks of information security threats, algorithmic risks, as well as risks of digital dependence and disruption of the digital infrastructure [13].

Modern approaches to risk management define it as a continuous management process aimed at identifying, assessing, monitoring and minimizing risks in the context of strategic management of the enterprise. The concept of comprehensive enterprise risk management considers the management of all types of enterprise risks and their consideration when making strategic management decisions by the enterprise. The risk management process in modern conditions is focused on timely identification of risks, scenario forecasting of events and increasing the adaptive response of the enterprise [13].

Information capabilities of risk management in the enterprise can be significantly expanded due to digital transformation.

The use of artificial intelligence, Big Data, machine learning, digital platforms and predictive analytics allows for continuous monitoring of business processes, predict alternative scenarios of events and identify deviations from the strategic goals of the enterprise. In such conditions, risk management becomes an important element of the digital decision support system, which ensures the adaptability of the enterprise to changes in the external environment [2, 3].

The interaction of risk management with digital credit management and innovative development of the enterprise plays a decisive role. The implementation of innovative projects is always associated with a high level of technological and financial uncertainty. At the same time, digital credit management is associated with the risks of loss of liquidity, credit burden, instability of the cost of financial resources and cyber threats in the field of digital finance. The combination of these components creates conditions for comprehensive management of strategic risks of the enterprise and increases the ability to ensure sustainable development [8, 9].

At the same time, the modern approach to risk management focuses not only on reducing possible losses, but also on creating conditions for using strategic opportunities. Research proves that effective risk management is necessary to increase organizational flexibility, increase the adaptive potential of the enterprise and increase strategic resilience. It is these visions that will help not only reduce the impact of negative factors, but also provide an opportunity to use crisis situations for the purpose of organizational learning, innovation and sustainable development [6, 7].

Risk management considers the entire set of interrelated risks: financial, operational risks, cyber risks, information risks associated with digital transformation, strategic risks. A comprehensive analysis of all these risks gives impetus to the formation of an integrated strategic management system to ensure financial stability, innovative development and digital transformation of the enterprise.

Risk management today is a basic element of the strategic resilience of the enterprise.

Its importance lies not only in reducing the level of uncertainty, but also in ensuring the ability of the enterprise to identify threats in a timely manner, adapt to technological changes. This also creates conditions for ensuring the continuity of business processes and maintaining competitiveness in the long term. The integration of risk management with digital credit management and innovative development management ensures the formation of a holistic system of strategic enterprise management in the digital economy.

The analysis shows that digital transformation significantly changes the role of risk management in the activities of enterprises. It ceases to perform only the function of responding to negative events and is increasingly integrated into the strategic management system. The main differences between traditional and modern approaches to risk management in the digital economy are given in Table 3.

Table 3

Enterprise risk management according to the traditional and digital approach

Criteria	Risk management using the traditional approach	Digital Risk Management
Information base	Statistical data and expert assessment	Data from major digital platforms and AI systems
Monitoring	Periodic	Continuously, in real time
Risk response	Response after the risk occurs	Risk prediction, early detection, preventive measures
Tools	Expert assessment, analysis	Predictive analysis, digital decision support systems
Aim of the approach	Minimization of consequences	Ensuring adaptability, strategic resilience, optimizing management decision-making

Table 3 presents the differences in criteria in the context of enterprise risk management in the digital economy. The modern approach primarily uses digital technologies, continuous monitoring, as well as predictive analytics and identification of potential threats to the enterprise. This approach ensures increased adaptability of the enterprise, ensuring strategic resilience and long-term competitiveness of the enterprise.

3.2. Conceptual model of the formation of strategic resilience of the enterprise

Analysis of modern scientific research shows that strategic management of the enterprise in the digital economy is mostly considered from the perspective of individual components of digital transformation, innovation development, financial resources management or risk management. At the same time, most existing conceptual approaches do not provide a holistic explanation of the mechanism of interaction of these components in the process of ensuring strategic resilience of the enterprise. In particular, digital credit management, innovative development and risk-oriented management are mostly considered as separate functional components, which complicate the formation of an integrated strategy for the digital development of an enterprise [3].

In addition, existing models of digital transformation mainly focus on the implementation of digital technologies or the development of digital competencies, without taking into account the financial instruments for ensuring digital transformation and the interaction between innovative activity, risk management and strategic sustainability of the enterprise. As a result, the mechanism for ensuring strategic resilience as an integral result of the interaction of the above elements remains insufficiently studied.

Taking into account the above, a conceptual model of the formation of strategic resilience of an enterprise in the digital economy was developed within the framework of the research, which combines digital credit management, innovative development management and risk management into a holistic system of strategic management of the enterprise. Compared to existing approaches, the proposed model defines strategic resilience not as an independent characteristic of an enterprise, but as the result of a complex interaction of financial, innovation and management mechanisms, the functioning of which is ensured by digital technologies.

The conceptual model of the formation of strategic resilience of an enterprise in the digital economy is presented in Fig. 1.

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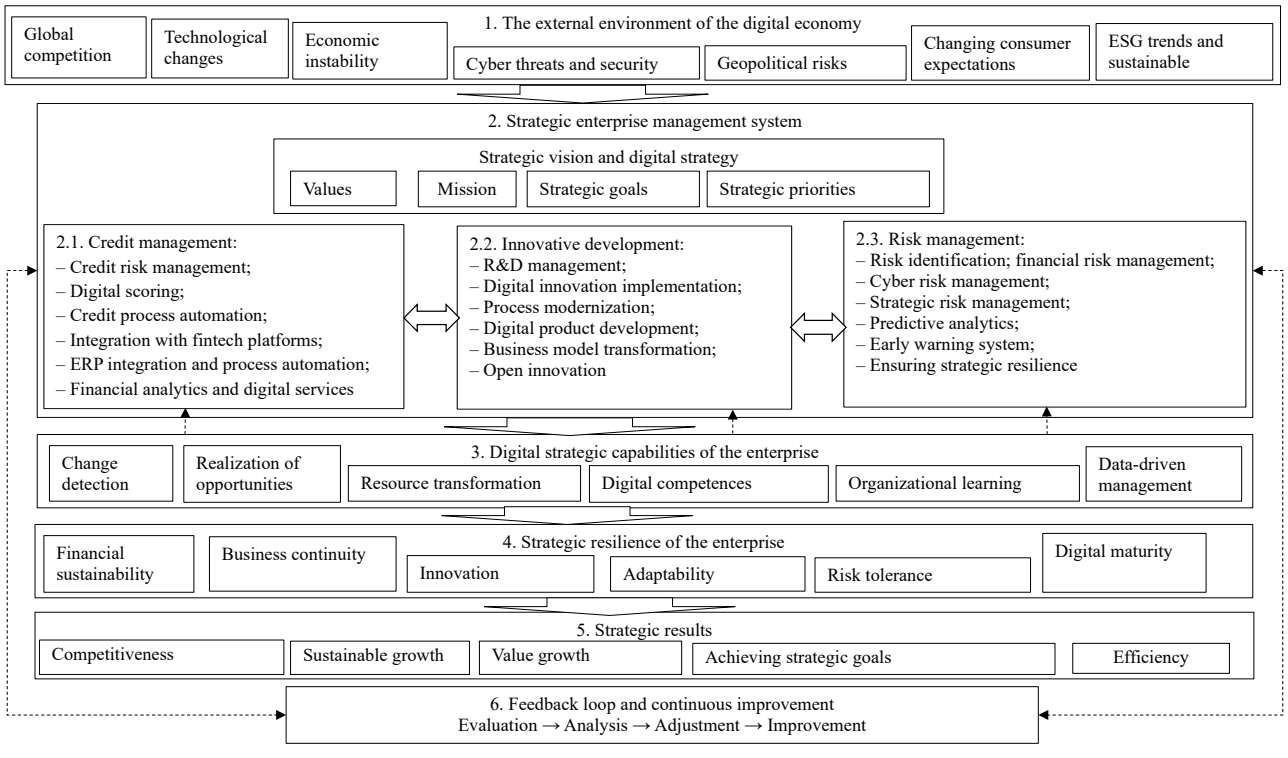


Fig. 1. Conceptual model of forming strategic resilience of an enterprise in the digital economy

The developed model is based on a systemic approach to strategic enterprise management and describes the cause-and-effect relationships between the key elements of digital transformation.

The strategic enterprise management system is the main element of the developed model. The system determines development priorities, coordinates the interaction of three strategic subsystems: digital credit management, innovative development management and risk management. The proposed model combines these subsystems into an integrated system, which differs from traditional models. Digital credit management serves as the financial basis for implementing an innovation strategy, then innovative development affects the formation of competitive advantages and ensures the adaptability of the enterprise, risk management affects the continuity of operations. This occurs through the identification, assessment and minimization of financial, technological and strategic risks. In the complex, the interaction of the system components ensures the strategic resilience of the enterprise.

An important feature of the proposed model is the presence of an intermediate level – digital strategic capabilities of the enterprise. Their role is to transform resources and competencies under the influence of changes in the external environment by combining digital technologies with the strategic management process. It is with the development of digital strategic capabilities that the enterprise promptly identifies new opportunities, adapts the business model and forms long-term creditworthiness. This model structure corresponds to modern approaches to digital transformation and organizational resilience [3, 7].

The practical significance of the developed model lies in its use as a conceptual basis for developing digital strategies of the enterprise, during the improvement of corporate governance and in the process of assessing the level of strategic resilience and applying digital transformation programs.

3.3. Integrated assessment of the strategic resilience of enterprises in the digital economy

The integrated assessment of the level of strategic resilience of enterprises was carried out on the basis of official Eurostat statistical data. For the research, a sample of ten countries of the European Union was formed, which are characterized by different models of digital development and the level of digitalization, innovative activity and risk management tools.

The analysis includes a system of indicators characterizing the level of use of cloud technologies, artificial intelligence technologies by enterprises, the digital intensity index, research and development spending, and the use of cybersecurity measures. The latest available Eurostat statistical data were used for the analysis: for 2025 – for indicators of the use of cloud technologies and artificial intelligence, for 2024 – for other indicators under research. This ensures the relevance of the results obtained.

The following countries are included in the sample: Denmark, Sweden, Finland, the Netherlands, Germany, France, Spain, Poland, Romania and Bulgaria, i. e. countries with different levels of digital development. This approach provides an opportunity to assess the impact of the studied factors on the formation of strategic resilience of enterprises and to compare the leading countries of digital transformation with countries at different stages of digital development.

To ensure comparability, the normalization of indicators with different units of measurement was carried out using the Min-Max method. Further, the weights were determined using the Entropy Weight Method, after which the integral Digital Strategic Resilience Index (*DSRI*) was calculated. The obtained index values became the basis for ranking countries and further analysis of the relationship between digitalization, innovative development and strategic resilience of enterprises.

The initial statistical data used for further calculations of the integral Digital Strategic Resilience Index (*DSRI*) are given in Table 4. Cloud computing and Artificial Intelligence are given for 2025, while the Digital Intensity Index, GERD and ICT Security are given for the latest available year 2024 according to the Eurostat methodology.

Since the studied indicators have different units of measurement and significantly differ in the range of values, their direct comparison is incorrect. In particular, the indicators of the use of cloud technologies, artificial intelligence, digital intensity and ICT security are measured in percentages, while the GERD indicator is determined in euros per capita. Therefore, at the first stage of calculations, the indicators were normalized using the Min-Max method, which ensures that all variables are brought to a single scale from 0 to 1.

Table 4

Initial statistical data for calculating the integral Digital Strategic Resilience Index (*DSRI*)

Country	Cloud computing (%)	Artificial intelligence (%)	Digital intensity (%)	GERD (EUR per inhabitant)	ICT security (%)
Denmark	68.88	42.03	90.76	1241.34	97.53
Sweden	72.00	35.04	87.02	1381.26	92.65
Finland	79.21	37.82	92.76	1077.62	98.74
Belgium	61.62	34.54	74.30	1275.49	96.12
Netherlands	68.49	33.21	81.46	1010.07	95.75
Germany	53.91	25.97	80.51	1108.48	96.50
France	40.41	18.16	69.31	611.71	93.20
Italy	75.60	16.40	70.72	294.48	92.92
Poland	54.71	8.36	70.01	206.65	94.11
Bulgaria	17.83	8.55	50.94	81.31	83.23

Note: compiled according to [16]

The normalization was performed according to the formula

$$z_{ij} = \frac{x_{ij} - x_j^{\min}}{x_j^{\max} - x_j^{\min}}, \quad (1)$$

where z_{ij} – the normalized value of the indicator; x_{ij} – the actual value of the indicator; $x_j^{\min}$ – the minimum value of the indicator; $x_j^{\max}$ – the maximum value of the indicator.

All the indicators used belong to stimulants, that is, an increase in their values positively affects the level of strategic management of enterprises. The results of normalization are presented in Table 5.

Since individual indicators are characterized by different information value and unequal variation between countries, the next stage of the research was the determination of their weight coefficients. To minimize the subjectivity of expert assessment, the entropy method (Entropy Weight Method), which is widely used in modern researches of multi-criteria assessment, was used.

First, the share of each indicator is determined

$$p_{ij} = \frac{z_{ij}}{\sum_{i=1}^{n} z_{ij}}. \quad (2)$$

Then the entropy is calculated

$$e_j = -k \sum_{i=1}^{n} p_{ij} \ln\left(p_{ij}\right), \quad (3)$$

where

$$k = \frac{1}{\ln n}. \quad (4)$$

Then the diversification coefficients are determined

$$d_j = 1 - e_j, \quad (5)$$

and the weight coefficients are calculated as

$$w_j = \frac{d_j}{\sum d_j}. \quad (6)$$

After normalizing the initial indicators, the next stage of research was the determination of their weight coefficients. To minimize the subjectivity of the assessment, the entropy method was used, which is based on the assessment of the information saturation of each indicator and is widely used in multi-criteria analysis. The calculated weight coefficients are given in Table 6.

The results of the entropy calculation show that the largest contribution to the formation of the *DSRI* integral index is made by the indicator of the use of artificial intelligence technologies (0.314). The next largest weight coefficient is the GERD indicator (0.266), which reflects the intensity of investment in research and development. The results obtained confirm that among the studied indicators, the use of artificial intelligence technologies and the intensity of investment in research and development have the greatest impact on the value of the integrated index when assessing the strategic resilience of enterprises. At the same time, the Digital Intensity Index (0.152) and Cloud Computing (0.145) indicators also significantly affect the integral assessment. This confirms the importance of the level of digital development of enterprises and the use of cloud services to ensure strategic resilience. The ICT Security indicator (0.124) received the smallest weight coefficient, which is explained by the lower variability of its values among the studied countries. This confirms that cybersecurity measures have already become a common practice in most EU countries and have a lesser impact on the level of strategic resilience of enterprises.

Table 5

Normalized values of indicators for calculating *DSRI*

Country	Cloud norm	AL norm	DII norm	GERD norm	ICT Security norm
Denmark	0.832	1.000	0.952	0.892	0.922
Sweden	0.883	0.792	0.863	1.000	0.607
Finland	1.000	0.875	1.000	0.766	1.000
Belgium	0.713	0.778	0.798	0.919	0.831
Netherlands	0.825	0.738	0.730	0.714	0.807
Germany	0.558	0.523	0.707	0.790	0.856
France	0.368	0.291	0.439	0.408	0.643
Italy	0.941	0.239	0.473	0.164	0.625
Poland	0.601	0.000	0.456	0.096	0.701
Bulgaria	0.000	0.006	0.000	0.000	0.000

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Table 6

Weighting coefficients of the *DSRI* indicators

Indicator	Entropy (e_i)	Diversification ($d_i = 1 - e_i$)	Weight (w_i)
Cloud	0.939	0.061	0.145
AI	0.868	0.132	0.314
DII	0.936	0.064	0.152
GERD	0.888	0.112	0.266
IST Security	0.948	0.052	0.124

After determining the weighting factors, the next stage of research is the calculation of the integral index Digital Strategic Resilience Index (*DSRI*). The index was calculated as a weighted sum of normalized indicators reflecting the level of digitalization, innovative development and digital risk management of enterprises.

The calculation of the integral index was carried out according to the formula

$$DSRI_i = \sum_{j=1}^{n} w_j z_{ij}, \quad (7)$$

where *DSRI* – the integral index of strategic management for the *i*-th country; w_j – the weighting factor of the *j*-th indicator; w_j – the normalized value of the *j*-th indicator.

The obtained values of the integral index are given in Table 7.

Table 7

Results of the Digital Strategic Resilience Index (*DSRI*) calculation

Rank	Country	*DSRI*
1	Denmark	0.930
2	Sweden	0.899
3	Finland	0.849
4	Belgium	0.816
5	Netherlands	0.752
6	Germany	0.672
7	France	0.404
8	Italy	0.399
9	Poland	0.268
10	Bulgaria	0.002

To clearly display the results obtained, a graphical representation of the ranking of the studied countries by the value of the *DSRI* integral index was constructed (Fig. 2).

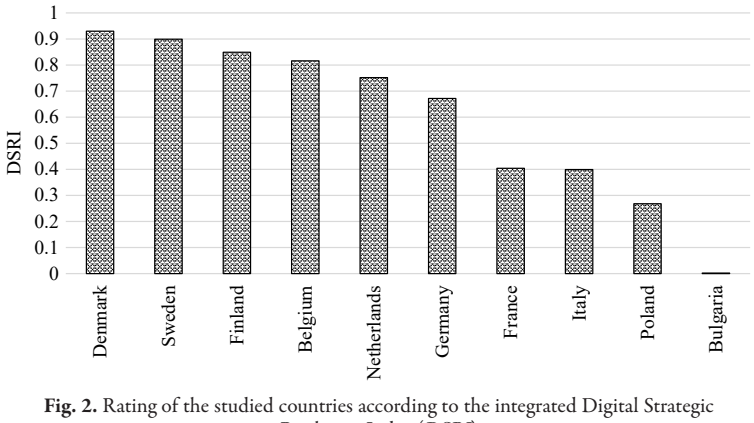


Fig. 2. Rating of the studied countries according to the integrated Digital Strategic Resilience Index (*DSRI*)

The results of the calculation of the Digital Strategic Resilience Index (*DSRI*) indicate a significant differentiation of the studied countries in terms of the level of development of strategic management of enterprises in the conditions of the digital economy (Table 4, Fig. 2). Index values range from 0.002 in Bulgaria to 0.930 in Denmark, indicating marked cross-country differences in the degree of digitization, innovation activity, and effectiveness of digital risk management.

The highest value of the integrated index is in Denmark with a *DSRI* value of 0.930. This result is explained by the high share of enterprises that use artificial intelligence and cloud technologies, the high level of digitization of enterprises, as well as the significant expenditures of the business sector on research and development. The second and third positions were taken by Finland (0.899) and Sweden (0.849). These countries are characterized by a high level of use of digital technologies, active implementation of artificial intelligence, significant spending on research and development, and extensive use of cloud services. The combination of these factors ensures the formation of high digital maturity of enterprises and contributes to the formation of strategic resilience of enterprises.

The group with a high level of strategic resilience also includes Belgium, the Netherlands and Germany, which integral index values exceed 0.65. This result proves the systematic development of digital infrastructure, the widespread use of modern digital technologies and the attraction of investments in research and development.

Lower *DSRI* values were demonstrated by Italy, France and Poland. Despite the relatively high level of digital intensity of enterprises, the value of the integral index is lower due to the lower level of use of artificial intelligence technology, as well as the lower level of business investment in research and development.

Bulgaria received the lowest level of integral value (0.002), which determines the strengthening of the digital transformation of enterprises, the introduction and use of modern digital technologies and the growth of investments in innovative development.

The obtained results prove that in order to obtain a high level of strategic management of the enterprise, the systematic development of digital technologies, innovative activities and effective risk management is necessary. It has also been proven that the maximum value of the integral index belongs to countries that have a high level of digitalization of enterprises, consistently use artificial intelligence technologies and have significant amounts of funding for research and development.

The obtained results indicate the existence of regularity: countries with high DSRI values are distinguished at the same time by a high level of use of artificial intelligence, digitization of enterprises and significant investments in research and development. This allows to assert that strategic resiliency is achieved by integrating individual digital solutions with systemic innovation policy. At the same time, countries with lower values of the index have the opportunity to strengthen strategic resilience by strengthening digital transformation, increasing the amount of financing and expanding the use of artificial intelligence technologies.

The research results confirm that ensuring the level of strategic resilience of enterprises requires the systematic development of digital technologies, innovative activities and the risk management system. On the basis of the conducted research, practical recommendations for ensuring the strategic resilience of enterprises in the digital economy are proposed, which are listed in the Table 8.

The recommendations presented are comprehensive in nature and are focused on the integrated use of financial, innovation and management mechanisms in an integrated system of strategic management of the enterprise. Unlike traditional approaches, they are focused not only on the implementation of individual digital technologies, but on ensuring the strategic resilience of the enterprise through the coordinated development of digital credit management, innovation activities and the risk management system.

The implementation of the proposed recommendations will contribute to increasing the level of digitalization of enterprises, strengthening their financial stability and long-term competitive advantages.

Table 8

Practical recommendations for increasing the strategic resilience of enterprises in the conditions of the digital economy

Direction	Identified problems	Recommended measures	Expected result
Digital credit management	Insufficient use of digital financial instruments	Implementation of Open Banking, ERP. Automated Cash Flow Management	Ensuring financial stability and effective credit management
Innovative development	Low innovation activity, insufficient investment in R&D	Increase investment in digital innovations, R&D development, implementation of AI	Strengthening competitive advantages and digitalization
Risk management	Reactive nature of risk management	Use of Predictive Analytics, AI monitoring and early warning systems	Increasing strategic, financial and cyber risks
Strategic management	Insufficient integration of digital processes	Formation of a digital strategy based on Digital Strategic Resilience Framework (DSRF)	Ensuring strategic resilience of the enterprise

The research results provide grounds to argue that the level of strategic resilience of enterprises in the digital economy is formed by a combination of digital technologies, innovation activities, financial provision and risk management. The calculated Digital Strategic Resilience Index (*DSRI*) confirmed that the highest values are characterized by countries with a high level of enterprise digitalization. These countries are also characterized by the effective use of artificial intelligence technologies, a high level of research and development funding, as well as a high level of digitalization of management processes. This is consistent with current trends in the development of the digital economy. According to them, digital transformation provides long-term competitive advantages only if it is integrated with the overall strategic development of the enterprise [2, 3].

The results obtained are consistent with the conclusions of [11], which substantiate that the digital transformation of an enterprise is a necessary condition for the development of its dynamic capabilities. They are necessary for adaptation to rapid technological changes. This corresponds to the approach proposed in the article, according to which strategic resilience is based on the integration of digital credit management, innovation management and risk management. A similar point of view is held by [7]. They emphasize that organizational resilience is based on the development of adaptability, systematic knowledge management and the ability of the enterprise to respond in a timely manner to changes in the external environment. The research expands the existing approach, justifying that the development of digital capabilities alone will not ensure the strategic resilience of the enterprise. It is effective only under the condition of systemic interaction of financial, innovation and management mechanisms.

Of particular note are the results of entropy analysis, according to which the most significant influence in the formation of the integral index is provided by indicators of the use of artificial intelligence technologies and the intensity of research and development costs. The differences between different countries in the level of strategic management of the enterprise are determined by these factors. Such results coincide with the conclusions [1, 3], which emphasize the strategic value of digital technologies only in the conditions of their integration into the business model of the enterprise and the strategic management system of the enterprise.

It is also proven that there is no direct dependence between a high level of individual digital indicators and a proportional increase in the integral assessment of strategic resilience. An example is Italy, which has one of the highest levels of use of cloud technologies, but lags behind leading countries in the use of artificial intelligence and the volume of research and development funding. Thus, the effectiveness of digital transformation depends on the comprehensive development of all components of the enterprise's digital strategy.

This is confirmed by the findings in [9], where it is convincingly proven that the positive impact of digital finance on the performance of enterprises is directly realized through the comprehensive development of digital transformation and the reduction of financial constraints. At the same time, the research has proven the practical significance of the Digital Strategic Resilience Framework (DSRF) conceptual model. Compared with traditional approaches that separately research digital transformation, innovative development and risk management, the proposed model considers them as related components of the strategic management system of the enterprise. The results of the research prove that the highest values of the Digital Strategic Resilience Index (*DSRI*) are those countries in which digital technologies are combined with high innovative activity and risk management. This confirms the validity of the proposed model.

3.4. Limitations and directions of research development

The limitations of research are as follows. First, the empirical research was conducted only for ten countries of the European Union, which narrows the possibilities of generalizing the conclusions for other regions. Second, the Digital Strategic Resilience Index (*DSRI*) was formed on the basis of indicators available in open international statistical databases. Such aspects as digital competences of personnel, quality of corporate governance, level of ESG transformation and indicators of financial efficiency of enterprises were not included in the indicators. In addition, the use of cross-sectional data does not allow assessing long-term changes in the level of strategic resilience of enterprises.

A promising direction for further research is to improve the integral index *DSRI* by supplementing the system of indicators, taking into account ESG factors, characteristics of human capital and corporate governance. It is also advisable to use panel econometric models to empirically assess the impact of digital transformation on the strategic resilience of enterprises.

4. Conclusions

1. The need to transition from long-term planning to the formation of strategic resilience of the enterprise as a key characteristic of its development is substantiated. It is proved that strategic resilience should be considered as the ability of the enterprise to adapt to changes in the external environment, to ensure sustainable development and competitiveness in the long term. It is noted that ensuring the formation of strategic resilience of the enterprise requires the integration of digital technologies, innovative development and approaches to risk management.

2. The proposed model integrates digital credit management, innovative development management and risk management into a single system of strategic management of the enterprise. A feature of the proposed model is the integration of credit management, innovative development management and risk management into a single system of strategic management. Strategic resilience within the model is considered as the result of their complex interaction and determines the relationships between its components. This model construction ensures the coordination of financial, innovative and risk-oriented management processes and creates a basis for the formation of strategic resilience of the enterprise.

3. The results of calculations carried out for ten countries of the European Union demonstrated a significant differentiation of the level of strategic management of enterprises. The highest index values were demonstrated by Denmark (0.930), Finland (0.899) and Sweden (0.849). The country with the lowest index value is Bulgaria (0.002). It was

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determined that the greatest influence on the formation of the integral index is exerted by the use of artificial intelligence technologies and the intensity of investments in research and development. This confirms that in ensuring the strategic resilience of enterprises, the decisive role belongs to digital technologies and innovative activity. The practical significance of the proposed approach lies in the possibility of using the Digital Strategic Resilience Framework (DSRF) model and the integrated Digital Strategic Resilience Index (*DSRI*) to monitor the strategic resilience of enterprises.

Conflict of interest

The authors declare that they have no conflict of interest in relation to this research, whether financial, personal, authorship or otherwise, that could affect the research and its results presented in this paper.

Financing

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Data availability

Manuscript has no associated data.

Use of artificial intelligence

The authors confirm that no artificial intelligence technologies were used in the creation of this work, with the exception of the creation of Fig. 1 based on a concept provided by the authors.

Model and AI identification: OpenAI ChatGPT.

Section of the article where AI was used: the section containing the illustration of the model for building enterprise strategic resilience (Fig. 1).

Specific tasks performed with AI tools: OpenAI ChatGPT was used to generate the illustration depicting the conceptual model of building enterprise strategic resilience in the digital economy, which was used in the research. The authors provided a text description of the desired image, and OpenAI ChatGPT created the corresponding visualization.

Verification of AI-generated results: the authors verified the accuracy of the figure by comparing the resulting image with the model's theoretical principles; refined terminology and captions in accordance with academic standards; and performed editing and localization.

Impact on research conclusions: the use of OpenAI ChatGPT was merely supplementary. The generated figure did not influence the content or conclusions of the research but served only to enhance the clarity and readability of the material for the audience.

Declaration submitted by Nataliia Sablina.

Authors' contributions

Oleksii Shelest: Conceptualization, Methodology, Formal analysis; ***Tetiana Obydiennova***: Conceptualization, Methodology, Investigation; ***Nataliia Sablina***: Conceptualization, Methodology, Validation, Writing – review and editing, Project administration; ***Tatyana Kuzenko***: Conceptualization, Methodology, Investigation; ***Olena Revenko***: Conceptualization, Methodology, Formal analysis, Writing – original draft.

All authors have read and agreed to the published version of the article and are jointly responsible for the reliability, accuracy, and integrity of the data and research results presented in the article.

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