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DIGITAL TRANSFORMATION AS A FACTOR IN ENSURING ECONOMIC SECURITY OF ENTERPRISES

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Abstract. The *subject of the research* is the study of digital transformation as one of the factors of ensuring the economic security of enterprises. *Methodology*. The study uses general scientific methods, in particular theoretical generalisation, analysis and synthesis, statistical analysis and graphical methods for the visual presentation of research results. The aim is to analyse the role of digital transformation in ensuring the economic security of companies. *Conclusion*. Summing up the results, it is determined that the security of enterprises is a crucial element for their successful functioning and stability in the market. The impact of digitalisation on the economic security of enterprise is manifested through the positive impact of advanced digital technologies. Taking advantage of the digital economy leads to numerous positive aspects in business and contributes to achieving strategic goals and strengthening economic security. A conceptual model of the economic security of enterprises has been developed, in which digital transformation is a key tool, covering various aspects, including the conceptual apparatus, objectives, problem vision, subjects and objects of management. The model is aimed at creating conditions for sustainable development and maintaining the economic security of the enterprise at various stages of its life cycle. The programme for ensuring economic security within the framework of this model includes the stages of defining tasks, developing a scenario, implementing and evaluating efficiency. The mechanism of economic security is considered as a system of resources and interactions, with digital transformation as a central tool. Summarising the model and approach, the key aspects of ensuring the economic security of enterprises are revealed, taking into account the challenges and opportunities of the modern business environment. Digital technologies make it possible to increase the level of economic security, which in turn contributes to increasing the efficiency and competitiveness of individual companies, the economy as a whole and the standard of living of the population.

Key words: digital transformation, digitalisation, digital economy, economic security of enterprises.

JEL Classification: F52, B49, L86, D83

1. Introduction

To ensure the stability and successful development of any entity (state, region, industry or enterprise), it is important to take into account economic security issues. Economic security is one of the most important components of national security, along with political, information, demographic, environmental, scientific and technical, and other aspects of security.

Ensuring the state's economic security is determined by a number of factors, including stable development of national economic leaders, favourable conditions for entrepreneurship, stability of the financial system, appropriate institutional conditions, developed market infrastructure, investment attractiveness, flexibility and efficiency of state regulation of the economy.

In recent years, the global economy has undergone a process of digitalisation in all areas of society. The development patterns of the world economy at the beginning of the 21st century have led many countries to an active transition to innovative development. Digital technologies create a new quality of goods and services, contribute to the emergence of new business models and competitive advantages for economic entities, and improve the quality of life.

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Digital technologies have become essential for ensuring economic security in modern conditions. They open up new opportunities for modernising traditional industries, managing different types of resources and streamlining the processes of purchasing goods and services. Digital technologies also facilitate employment, simplify the selection and implementation of purchases, allow to quickly compare prices and quality of services, make operational decisions, and save time and money.

Digital technologies and innovations are driving innovation and modernisation. They allow businesses to improve their production processes and introduce new products and services, which increases their competitiveness.

Efficiency and productivity help to optimise resource management, automate production processes and increase labour efficiency. This helps to increase productivity and reduce costs. *Economic sustainability.* The use of digital technologies contributes to the creation of flexible and sustainable economic systems that can effectively withstand external and internal challenges. *Innovation activity.* The development of digital technologies stimulates innovation activity, which is crucial for ensuring the competitiveness of the economy on a global scale. *Development of the information ecosystem.* It helps to create improved information ecosystems that facilitate better interaction between market participants and new business opportunities. Overall, digital technologies play an important role in ensuring economic security, promoting sustainable development and competitiveness. The successful integration of these technologies into the economy can be a decisive factor in achieving economic and social goals.

Digitalisation is based on intangible assets, which depend on the development of human capital and the availability of in-demand knowledge, skills and competences. People, in turn, are the creators of innovations, including digital ones, which transform the critical resource of society, i.e., the human being.

Digital transformation in today's business environment is defined as one of the most important factors in ensuring the economic security of enterprises. This process involves the use and integration of digital technologies to optimise production processes and improve strategic management. The study of these processes is the focus of this research.

2. The State of Digital Transformation in the Context of Digital Economy Development

Digital transformation is an essential part of the overall business transformation strategy. It is a critical success factor and determines the outcome of any transformation project. The right technology, combined with people skills, streamlined processes and efficient operations, enables organisations to adapt to complex conditions, quickly and effectively seize promising opportunities, meet changing customer needs, drive growth and innovate, often in unexpected ways.

It is predicted that over the next decade, approximately 70% of value created will depend on digital products. In 2018, the global GDP accounted for by digitised businesses was 13.5 trillion USD. However, by 2023, it is expected to increase to 53.3 trillion USD (almost four times). This means that the digital sector generates more than half of the world's nominal GDP (Figure 1) (Shaping the future: value creation in digital infrastructure, 2022; Petroc, 2022).

Compared to industry or agriculture, the digital economy can be a critical factor in economic security, resilience and a reliable source of tax revenue, mainly due to its lower dependence on physical assets. The stability of the digital sector is particularly important in times of crisis. After the start of the full-scale invasion, the IT sector proved to be one of the most resilient sectors of the Ukrainian economy, with exports increasing significantly in 2022 (Opendatabot, 2022). Therefore, it is reasonable to assume that information technology

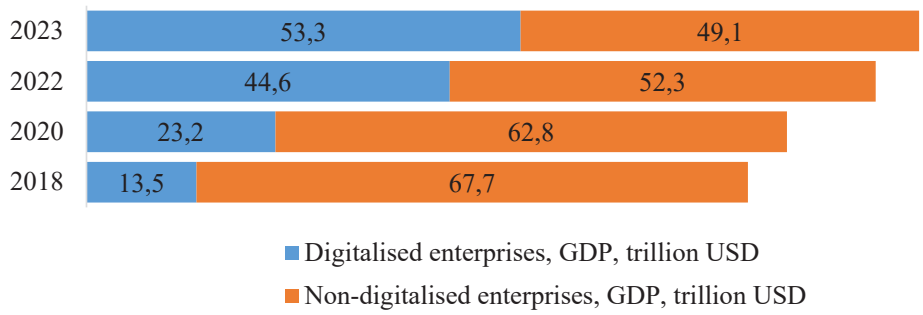

Figure 1. Digitalised enterprises in global GDP

Source: (Shaping the future: value creation in digital infrastructure 2022; Petroc, 2022)

can significantly increase the efficiency of the future recovery process. This means not only the development of the IT sector and the use of digital technologies in other industries to increase productivity, but also the implementation of digital solutions for the distribution of international aid and the control of its use, which helps to reduce the risk of corruption.

According to research by Zhang J., Zhao W., Cheng B., Li A., Wang Y., Yang N., Tian Y. (2022), the key factors contributing to the growth of the digital economy include a well-developed information and communication technology sector, solid educational institutions and competitive innovation. Information technology is the basis for digital transformation of enterprises (Dorofyeyev, et al., 2020; Zhang, et al., 2022). The development of technologies such as artificial intelligence, big data and the Internet of Things is increasingly influencing business processes. Scientific research, in turn, is the basis for the creation of information technology and other digital products that businesses continue to use. R&D requires a scientific and educational environment that fosters innovation and the training of highly qualified researchers and engineers (Rong, 2022). A special role in ensuring the further development of the introduction of innovations and new technologies for the further deepening of digitalisation processes is played by inclusive investments, which have been studied by researchers (Stepanenko, et al., 2023). In addition to innovation and investment factors, the growth of digital enterprises depends on the establishment of internal business processes. The unifying component of these processes is the organisational structure as a soft component of the internal environment, which links values, competences, goals and intentions, forming a fundamentally new vision of business in the digital context (Vlasenko, et al., 2023).

According to the 2022 results, the information and communication technology industry contributed 7.35 billion USD or 4.5% of Ukraine's GDP (Figure 2). There are about 8.2 thousand companies and enterprises providing digital services in the country, of which about 5 thousand are looking for new employees. More than 1.5 thousand of these are technology start-ups. According to the DOU, at the end of February 2023, 271,699 sole proprietors were working in the IT sector, which is 13.6% of all active sole proprietors at that time (taking into account that some sole proprietors may be employees) (IEconomics, 2023; Krupianyk, 2023).

The development of the information and communication technology (ICT) industry is primarily determined by public demand for the industry's products and services. Stimulating this demand requires an appropriate digital infrastructure environment, such as mobile and broadband Internet coverage, as well as a high level of digital literacy among the population. Ukraine is notable for the fact that these skills are concentrated mainly among young people. For example, although there were 49.3 million active mobile connections in the country at the end of 2022, of which 35.4 million (72%) had a mobile internet connection (Report on the activities of the National Commission, 2023), only 32% of people over the age of 60 used the internet every day and 48% did not use it at all. This means that a significant proportion of the population cannot use electronic services, such as making an appointment with a doctor or using the Diia system. Accordingly, the digital divide has become another aspect of inequality that public policy should address (Analytical report on the "Opinions and views of the Ukrainian population regarding state electronic services", 2023).

In contrast to information and communication technologies, the situation in Ukraine's science and innovation sector could be more positive. In the modern era, Ukraine occupies a low position in innovation rankings. For example, it ranks 34th out of 39 European countries in the Global Innovation Index 2022 (Global Innovation Index 2022) and 54th out of 64 countries in the Global Digital Competitiveness Ranking 2021 (The IMD World Digital Competitiveness Ranking 2021, 2021). This situation can be explained by insufficient funding for scientific research, inefficient organisation of the scientific sector and problems with intellectual property protection (Research and development expenditure by R&D type for 2010–2020). Despite some progress in this area in recent years, Ukraine continues to receive low scores in the 2022 UN eParticipation rankings (E-Government Survey 2022).

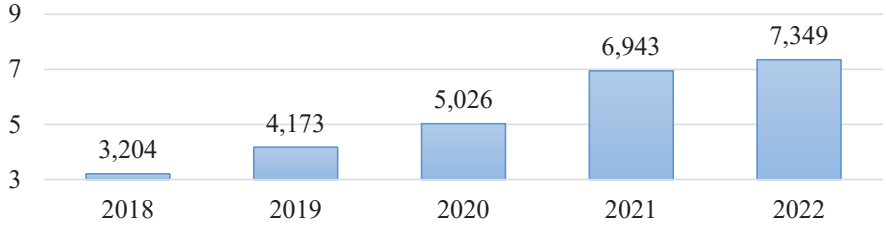

Figure 2. Export dynamics in the IT industry, billion USD

One of the reasons for this is the low level of patent activity in Ukraine. According to the World Intellectual Property Organisation (WIPO), only 1706 patent applications were registered in Ukraine in 2021, while the average for European countries was 12680 and for Eastern Europe 4010 (Intellectual property statistical country profile 2022).

Another problem is the need for more funding for the implementation of developments, for start-ups. In most developed countries, a built-in infrastructure helps turn innovative ideas into marketable products. This infrastructure includes venture capital funds, government and non-government grants, crowdfunding and other mechanisms. Unfortunately, Ukraine has a poorly developed infrastructure; for example, legislation does not define crowdfunding (Krupyanik, 2023).

In this way, the digital sector of the Ukrainian economy can ensure the stability and growth of financial flows necessary for the country's post-war recovery. Digital solutions are of financial interest and strategic importance, capable of increasing the efficiency of the industries in which they are implemented, especially in the government and military sectors.

The digital economy is based on information technology, education, science and innovation. The following steps are necessary for their development:

– Create a legislative framework to regulate alternative financing. Simplify procedures for raising private funds for universities and research institutions;
– reforming the higher education system, increasing the autonomy of universities and updating curricula to meet the needs of the labour market;
– increase the basic digital skills of the population through state-supported courses (e.g., through State Employment Centres);
– the implementation of digitalisation projects at the local level (digital hromadas), including the development of digital infrastructure, takes into account the needs of each hromada;
– continue reforms in the field of intellectual property protection, in particular, harmonisation of Ukrainian legislation with EU standards.

Companies need to strengthen their resilience, competitiveness and flexibility in order to grow and become more competitive. A key milestone is the development and transformation of the digital landscape, starting from the earliest stages of the supply chain, to meet the rapidly changing needs of customers for more personalised service and order fulfilment. It is also essential to modernise and implement innovative approaches to traditional business models (Digital Transformation Means Serving Customers, 2023; How to Make Sustainable Materials Use Matter, 2023).

The latest McKinsey survey highlights the urgent need to digitise and modernise processes and systems in the wake of the pandemic. Many executives recognise the obsolescence of their organisations' business models. Only 11% of respondents believe that current business models will be economically viable by 2023. A further 64% say their companies should build digital businesses to avoid losing competitiveness (The new digital edge: Rethinking strategy for the postpandemic era, 2021).

For modern companies, the question is no longer whether they need digitalisation to be competitive in the current business environment, but when they can start the process of digital transformation.

In general, complex trends determine a new approach to the role of the person in decision-making, his inclusion in the educational system, the development of skills in the field of digital technologies and their use to improve the quality of education and access to constantly updated knowledge. The organisation of the system of continuous education and the formation of an open network structure are becoming the defining features of the modern stage of social development and essential conditions contributing to the competitiveness of subjects and overcoming digital inequality.

To sum up the general conclusion, it is essential to note that digital transformation has become one of the critical factors at the current stage of development of society, which, on the one hand, contributes to solving various economic problems and ensuring economic security, and, on the other hand, gives rise to new risks and threats.

3. The Place of Digital Transformation in Ensuring the Economic Security of Enterprises

In today's environment, business is exposed to various risk factors and adapts to instability and negative impacts. Enterprises need to find appropriate solutions to complex problems and consider ways to reduce threats to their operations. The critical aspects of economic security management are ensuring effective operation, optimal use of available resources, maintaining the appropriate level of staff work and ensuring the quality of the company's business processes. It is also essential to continually encourage the building and development of existing capabilities.

The economic security of the enterprise is manifested in the harmonious functioning of all existing units that make up its organisational structure, with the aim of interaction to achieve essential goals in the areas of financial, intellectual, personnel, technical and technological, political and legal, informational, environmental, energy economic security, etc. Recently, the issue of introducing digital technologies

has become particularly relevant for enterprises and organisations, which requires a thorough study of the peculiarities of ensuring economic security in these conditions (Levkvovets, 2022).

The economic security of the enterprise is achieved through the most rational and efficient use of resources, which ensures the stable functioning of the enterprise. The level of economic security should be appropriate and ensure high business results. To effectively ensure the economic security of the enterprise, it is always necessary to apply a systematic approach, taking into account all aspects, circumstances, conditions and factors of activity (Pilipenko, & Pilipenko, 2017).

In order to minimise the negative impact on the company's activities and to create opportunities for its development, it is necessary to establish protection against the negative impact of the environment, in particular, individual components that form the economic security of the company. The conducted study identified the internal components of the economic security of the enterprise, which under the influence of various factors regulate its level: financial, market, commodity, interface, intellectual and personnel, technological, political, legal and information (Sosnovska, 2019).

Ensuring the economic security of enterprises by considering their functional components is the most effective method of creating this security. This method covers all spheres of the enterprise's activity and provides it with an opportunity for sustainable functioning on the market, effective management, competitiveness and future development, provided that threats from the external and internal environment are minimised. This means that the components of the economic security of enterprises will be able to react quickly to changes and adapt their activities to these changes. The introduction of digital technologies in the management of the warehouse, logistics, financial system, personnel management and tendering will contribute to the efficiency of the financial, market, raw material, intellectual, personnel and information components of the economic security of the enterprise.

The transformation processes associated with the introduction of digital technologies, like any other transformations, bring probable risks and real threats to the economic system of the enterprise, including the food industry. The economic security system of an enterprise in such conditions should not be limited only to the cybersecurity organisation. However, it should be studied comprehensively, taking into account the negative impact of the digitalisation process on all aspects of business development and the danger of digital technologies for the economic security system itself (Tkachuk, 2019; Novikova, et al., 2022; Bakay, 2020; Zhadko, & Samoilenko, 2020).

Figure 3 shows the sequence of three stages of enterprise transformation to adapt to the digital economy.

Thus, a systematic approach is developed to form a new regional landscape of the business, defining its structure, context and standards that support the business strategy. This approach involves planning the development of business processes and IT systems, allowing the enterprise to evolve into a unique architecture that combines various elements, such as Structural elements (departments, project teams, IT systems, databases, equipment, offices, warehouses). Behavioural elements (competencies, actions and functions of system participants). Passive elements

Stages	Stage I	Stage II	Stage III
Actions	Implementation of a full-fledged systemic business model that allows linking the company's strategy and tools for its implementation, eliminating gaps in the organisational and functional structure.	Development of system management in accordance with the concept of enterprise architecture, which allows to combine all components of its activities: infrastructure, management systems, information, processes and people.	Merging enterprise architecture with business strategy and information technology strategy as part of the enterprise.
Results	Modernisation of the company's internal structure, which in turn improves efficiency.	Expansion of the external information environment and formation of a single information space as a basic condition for the digital economy.	

Figure 3. Stages of enterprise transformation in the process of digital transformation

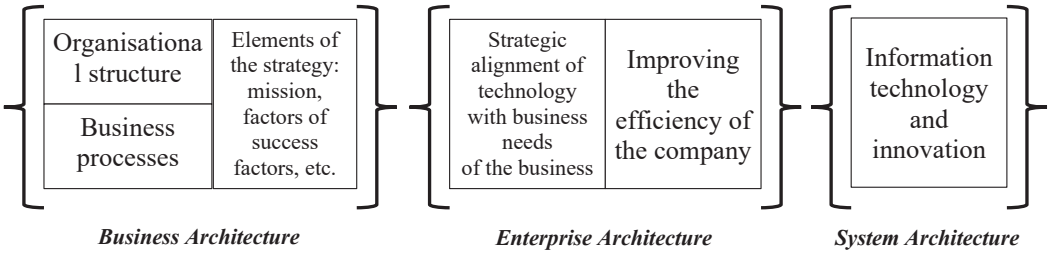

Figure 4. Enterprise architecture as a business model in the context of digital transformation

(documents, data objects, digital twins of reality). Motivational and goal elements (legal norms, principles of action, values, market drivers, stakeholders) (Handoyo, et al., 2023).

Enterprise architecture is a modern field of knowledge that integrates the individual components of an enterprise, such as systems, processes, people, infrastructure, data, goals, objectives, requirements, and so forth (Figure 4).

The idea of enterprise architecture is not limited to the description of organisational, functional, information and other processes, but also forms the relationship between structural components (business architecture) and information systems of the organisation (IT architecture) (Babar, & Yu, 2015).

It is important to emphasise that Enterprise Architecture is not just a unifying environment for two components (business and IT), and its concept should be understood more broadly as a systematic approach to enterprise management. This approach creates links and interactions between the strategic factors of the enterprise. In this way, enterprise architecture becomes a strategic management centre that encompasses all the critical components to maintain the sustainability of the company (Salem, & Zafar, 2016; Edwin, 2012).

Considering the concept of enterprise architecture as the integration of various components such as systems, processes, people, infrastructure, data, goals and objectives, it can be recognised that this concept has become an essential foundation for creating a favourable ecosystem and marks the transition to a new direction of strategic management – a multidisciplinary strategy (What is the Role of Enterprise Architecture in Digital Transformation, 2023).

In today's turbulent environment, it is necessary to adhere to several strategies simultaneously, not limited to priority areas. The time for choosing and adhering to a specific type of strategy is over, and in today's bimodal environment, the company's management system must be multidisciplinary. The improvement of this tool is possible through organisational changes that include the company's content, processes and development strategy, leading to a new business model (Teubner, & Stockhinger, 2020).

It is essential to recognise that companies seeking information transformation and the digital economy must have the right tools to predict, identify and manage emerging trends. However, according to some studies, only about 64% of top managers in the global market see the challenge of the "information tsunami" as a need to improve their company's IT infrastructure. In Ukraine, only 35% of CEOs do, and 62% do not prioritise digital transformation issues, focusing on traditional strategies. Some companies do not see the threat of digital transformation (43%, 52% in Ukraine), and even if they recognise its impact, they do not set targets to respond to it (Mazur, 2022).

Nevertheless, the trend towards the creation of organisational ecosystems indicates that companies are actively looking for practical tools to survive in the new economy and need models to reap the benefits of digitalisation while being protected from possible threats related to the volume and methods of information exchange.

The paper formulates a number of requirements for the methodological apparatus for assessing the economic security indicators of an entity, which must be observed:

1. The system should include a set of interrelated assessment indicators.

2. The set of indicators and parameters should be as close as possible to statistical observation.

3. The surveillance methodology involves systematic monitoring of indicators and possible threats to scientific, technological and economic security.

4. The indicators should allow a constant comparison of their current values with the limit values (thresholds) in order to assess the degree of sustainability of the functioning of the facilities in the region and the level of threats to economic security.

The system of indicators characterising the stability of economic security of the subject should be hierarchical, taking into account the stability of all the main socio-productive links of the subject.

The assessment of the subject's stability should take into account the current state of security and the forecast of its stable development under the influence of internal and external factors. It is also necessary to assess the threats to economic security associated

with the socio-economic and political development of the subject, the territory and the region.

Summarising the scientists' research, a conceptual model for ensuring the economic security of enterprises, the main tool of digital transformation, has been developed. The model considers a variety of conceptual apparatuses, defines goals, ideas, vision of problems, subjects and objects of management, and defines tasks for achieving goals, principles and mechanisms for ensuring economic security. A graphical representation of this model is shown in Figure 5.

In this case, the economic security of the enterprise means its ability to ensure profit at all stages of the life cycle, to use resources efficiently, to minimise risks at various levels and to avoid significant deviations from the overall strategy and objectives. The main goal of ensuring the economic security of the enterprise is to create conditions for sustainable socio-economic development, maintaining viability and economic stability even under the influence of negative internal and external factors.

The critical tasks of ensuring the economic security of companies include: forecasting the development of the organisation; maintaining the integrity of financial and physical resources; managing strategies; preventing cyber-attacks; creating and maintaining a positive image.

The object of security is the stable economic condition of the business unit, which does not exceed critical levels in the industry context. The subject is the responsible management unit, acting within the competencies and powers defined by the service instructions.

The basic principles for ensuring the economic security of companies include science, consistency, comprehensiveness, unity of command, collegiality, planning, the optimal combination of centralisation and decentralisation, information equipment, analysis and a combination of rights, duties and responsibilities.

The implementation of the model includes the analysis of external and internal information on the economic security of enterprises. The programme for ensuring the economic security of the enterprise includes the formulation of priority tasks, the development of a scenario, the implementation of the programme and the evaluation of its effectiveness.

The mechanism for ensuring economic security is a system of resources and ways of interaction aimed at harmoniously ensuring the stability of an economic entity.

Addressing the issue of mechanisms for ensuring the economic security of enterprises, two different types of these mechanisms can be defined. The first is external mechanisms, which combine standard methods of organising the interaction of individual

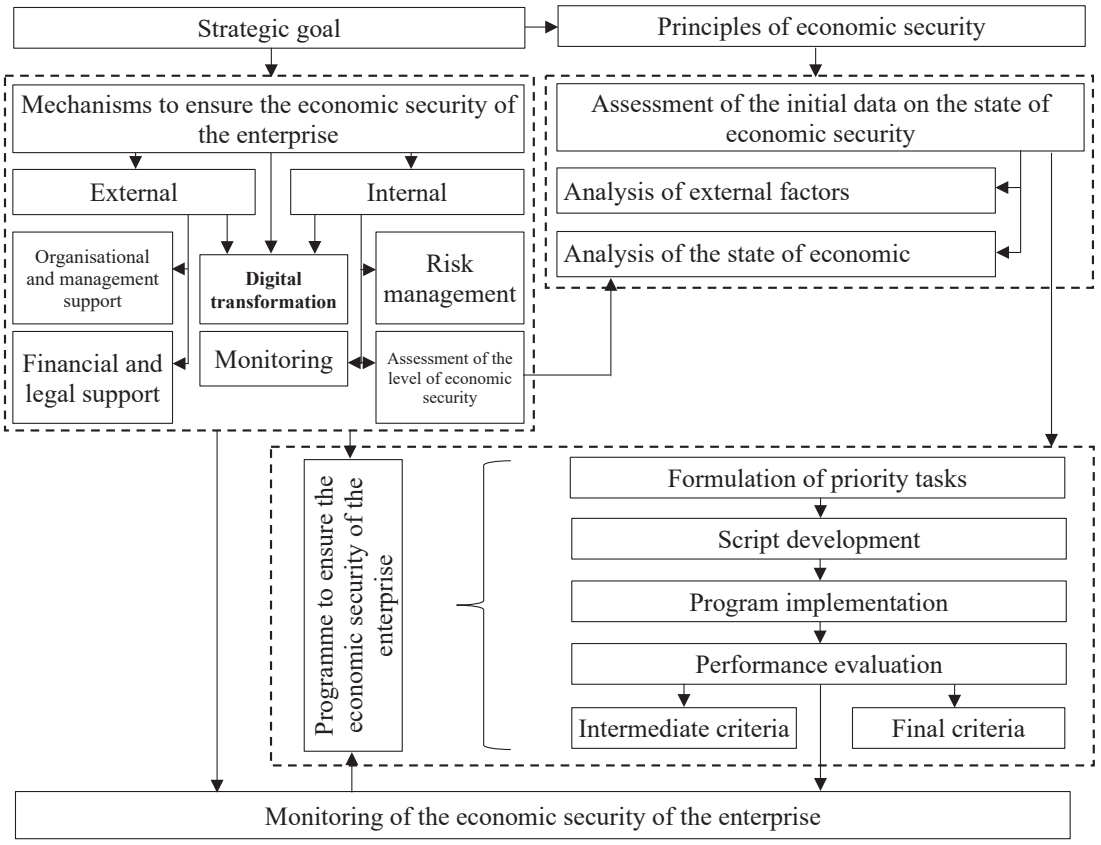

Figure 5. Conceptual model for ensuring the economic security of enterprises

components of the system to ensure economic security. This type includes various subjects of the external environment of SMEs, such as the state and its institutions, markets for goods, services, innovations, labour, financial institutions, competitors, suppliers, consumers, public and other organisations, and individuals. The second are internal mechanisms, which are ways of organising internal business processes to ensure their economic security. These mechanisms determine how the company organises its activities internally in order to use resources efficiently and minimise risks. The central link and primary tool for ensuring economic security is digital transformation.

Existing business models and their modifications, even if they take into account the challenges of the new economy, may have a conceptual problem – the need for a direct link with the economic security of the enterprise. It is essential to consider the sustainability of production as a critical factor in ensuring economic security, because an effective model should consider the comprehensive protection of scientific, technical, operational and human resources from the influence of the external environment and have a system of objective indicators for its assessment.

The digital transformation of enterprises is determined by the current state and the influence of globalisation factors, such as: globalisation and integration, the conduct of military operations on a significant territory of Ukraine, etc. (Kramarenko, et al., 2022; Irtyshcheva, et al., 2022; Pryshchepa, Kardash, Yakymchuk, et al., 2020).

New digital technologies in the digital transformation process have led to innovative changes in all areas of the company and stimulate the creation of new business models. Thus, the introduction of digital transformations is a prerequisite for achieving a high level of economic development of the enterprise and a platform for improving the position of the enterprise in today's competitive environment. Digital technologies make it possible to increase economic security, which contributes to increasing the efficiency and competitiveness of individual enterprises, the economy in general and the standard of living of the population.

4. Conclusions

In conclusion, the disappointing result of the study is that the successful performance of the functions of enterprises and their stable positioning on the market is possible only by ensuring their economic security. The digitalisation process affects the level of economic security of the enterprise through the positive impact of improved digital technologies on security components. Using the digital economy creates many positive aspects in business activity, contributes to the achievement of goals and ensures economic security.

A conceptual model for ensuring the economic security of enterprises, focusing on digital transformation as the primary tool, has been proposed. This model considers various aspects such as the conceptual apparatus, goals, ideas, vision of problems, subjects and objects of management, tasks, principles and mechanisms for ensuring economic security. The economic security of an enterprise determines its ability to generate profit at all stages of the life cycle, to make optimal use of resources, to minimise risks and to maintain stability through the overall strategy and objectives. The main goal is to create conditions for sustainable socio-economic development and to maintain the economic stability of the company even under the influence of negative factors. The model provides for the analysis of external and internal information, and the programme for ensuring economic security includes the stages of task formulation, scenario development, implementation and evaluation of effectiveness. The mechanism for ensuring economic security is considered as a system of resources and ways of interaction to ensure the sustainability of an economic entity, the central link and primary tool of which is digital transformation. In general, this model and approach identifies the critical aspects of ensuring the economic security of enterprises, taking into account current challenges and opportunities.

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