The concept of management of digital transformation of economic activity of industrial enterprises

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Abstract. A concept of managing the digital transformation of economic activity of industrial enterprises has been proposed, which includes a target management model, a sequence of managerial actions implementation, a management toolkit, management support, and efficiency, aimed at achieving organizational ambidexterity by simultaneously managing existing business processes and exploring and developing new opportunities for the development of an industrial enterprise based on the implementation of digital management and digital innovations. This concept allows defining goals, objectives, principles, target model, organizational structure, action plan, identifying risks, conducting a diagnosis of the current level of digitization, and evaluating the effectiveness of managing the digital transformation of economic activity of industrial enterprises.

1 Introduction

The world has entered a deep transitional period, witnessing incredible development of new technologies that transform the economy and inspire future generations. Breakthroughs in communications, biotechnology, quantum and exaflop computing, artificial intelligence, as well as achievements in industrial robotics and the emerging space economy open up broad prospects for the development of high-tech industries, economic productivity, and the achievement of sustainable development goals. Digital technologies are a key tool for solving a wide range of business and government challenges. It is one of the most important tools for future success. Adapting to a digital technology-oriented market is a top priority for businesses in all industries, including industry. However, while technical solutions are now quite developed, the practice of managing digital transformation, the methodological foundations of implementing digital technologies, and even the unified conceptual apparatus in this area still require deep scientific research.

The digital transformation of industry is one of the priority directions of development of the national economy. It should ensure the technological independence of the country, promote the commercialization of Russian research and development, as well as accelerate the technological development of Russian companies and increase the competitiveness of their products and solutions in the global market. This is achieved through achieving digital maturity by modernizing the management of Organizer of Production processes. As a result of such transformation, there is a significant increase in labor productivity and gross domestic

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The relevance of implementing digital transformation management of industrial enterprises is determined by solving existing systemic problems, such as low labor productivity, inefficient use of resources, low efficiency of Organizer of Production capacity, high rejection rate, long “time to market,” high cost of product ownership, as well as high transaction costs and complexity of forming responsible cooperative chains. Solving the problems of managing digital transformation of industrial enterprises requires the implementation of an effective management mechanism, supported by scientifically based theoretical approaches, conceptual provisions, practice-oriented methodological tools, recommendations, models, and algorithms.

The scientific hypothesis of the research is based on the assumption that effective management of the digital transformation of economic activity of industrial enterprises based on the proposed management mechanisms, methods for assessing the level of management, the digital kaizen model, and the algorithm for choosing a management strategy will ensure the technological independence of the country, opportunities for commercialization of Russian research and development, as well as accelerate the technological development of Russian companies and ensure the competitiveness of the products and solutions they develop in the global market by achieving “digital maturity” through modernizing the management processes. This should lead to a significant increase in labor productivity and gross domestic product in the manufacturing sector and, therefore, to an increase in the standard of living of the country’s citizens.

The object of the research is domestic industrial enterprises. The subject matter of the research is managerial, organizational, and economic relations that arise in the process of solving a complex of theoretical, scientific-methodical, and practical issues and problems of managing the digital transformation of economic activity of industrial enterprises. The aim of the research is to develop and improve theoretical and methodological provisions and practical recommendations for managing the digital transformation of economic activity of industrial enterprises.

2 Methods

The theoretical and methodological basis of the research includes works by domestic and foreign scientists on the problems of managing industrial systems at different levels, developing a digital economy, managing the digital transformation of economic activity, digital maturity, theory and practice of digital management, digital innovation, digital strategy development, organizing the process of managing digital transformation based on digital innovation units, development and management of digital ecosystems. The methodology of the research is based on existing theoretical developments related to the economy of the industry, issues of managing industrial complexes, industries, enterprises.

The fundamental approach used in the research is the dialectical approach, in addition to which systemic, network, symbiotic, interdisciplinary, cross-industry, project, value-based approaches, comparative analysis, benchmarking methods, and others were used.

3 Literature review
4 Results and discussion
ensure the technological independence of the state, the possibility of commercializing the transformation of the economic activity of industrial enterprises.

The structure of the systemic concept of managing the digital transformation of economic activity of industrial enterprises (Fig. 1) includes:

1. The goal of managing digital transformation;
2. The toolkit for managing digital transformation;
3. Main principles of managing digital transformation;
4. Diagnosis of the current level of digitalization;
5. Organizational structure of managing digital transformation;
6. Supporting (personnel, financial, infrastructure, security) conditions of digital transformation;
7. Risks of managing digital transformation;
8. Plan or roadmap for managing digital transformation;
9. Safety
10. Digital culture
11. Efficiency
12. Economic efficiency
13. ESG-efficiency
14. Value effectiveness

Fig. 1. The structure of the systemic concept of managing the digital transformation of economic activity of industrial enterprises.
Russian companies and ensuring the competitiveness of the products and solutions they develop on the global market by achieving ‘digital maturity’ through the modernization of Organizer of Production management processes, which should lead to a significant increase in labor productivity and growth of gross domestic product in the manufacturing sector and, therefore, to an increase in the level of citizens’ well-being.

However, it also includes a number of other sub-goals:

- Improving productivity and quality of products: digital technologies can help accelerate Organizer of Production processes and optimize resource usage, which will lead to increased productivity and improved product quality.
- Cost reduction: digital technologies can automate many processes and improve resource management, which will lead to a reduction in Organizer of Production costs and a shortened Organizer of Production cycle time.
- Increased flexibility and adaptability: digital technologies allow companies to quickly respond to changes in the market environment and adapt to new consumer requirements.
- Improving management and decision-making: digital technologies can help improve management processes and decision-making at the enterprise, providing more accurate and timely information for decision-making.
- Developing new business models: digital technologies can help companies create new business models and seek new opportunities for growth and development.
- Improving interaction with customers: digital technologies can help improve communication and interaction with customers, which can lead to increased customer satisfaction and loyalty.
- Formation of a digital innovation ecosystem. Digital technologies can help enterprises create ecosystems that unite different industrial enterprises, which can lead to the creation of new opportunities for cooperation and joint activities.

II. The tasks of managing the digital transformation of industrial enterprises include analyzing the current state of the industrial system, defining goals and objectives, planning and risk assessment, implementing a plan and introducing digital technologies, training employees and changing the culture of industrial enterprises, as well as monitoring and continuous improvement of the process.

The tasks of managing the digital transformation of industry enterprises include:

- Stimulating demand for industrial products in the domestic market;
- Creating conditions for the growth of investments in research and development, including the development of new Organizer of Production technologies;
- Creating conditions for increasing cooperation between Russian enterprises, stimulating the integration of Russian producers into global supply chains, stimulating labor productivity growth and stimulating the export of Russian industrial products.

III. The principles of managing the digital transformation of industrial enterprises include a focus on business goals, flexibility and adaptability, integration and interaction, ensuring data security and confidentiality, developing new competencies and skills, continuous improvement and innovation, results orientation and effectiveness measurement.

One of the main principles of managing the digital transformation is the principle of organizational ambidexterity. This principle involves simultaneously managing existing business and exploring and developing new opportunities for business development. This principle is based on the idea that industrial enterprises should simultaneously maintain the stability of their current operations and seek new opportunities for growth and development. Industrial enterprises that apply the principle of organizational ambidexterity create special departments or teams that deal with research and development of new products,
services, business models, and technologies. These departments work in parallel with the main business processes of industrial enterprises and have their own goals, budgets, and deadlines for completing tasks. The goal of the principle of organizational ambidexterity is to ensure the long-term competitiveness of the industrial system and create conditions for growth and development. It allows not only maintaining current market positions but also seeking new opportunities to improve products and services, attract new customers, and expand activities.

IV. The target model of managing digital transformation includes defining specific goals that need to be achieved thanks to the implementation of digital transformation. It represents a holistic system that describes what the industrial system should be like after digital transformation and what specific results should be achieved.

The main elements of the target model of managing digital transformation can include:

1. Business goals and results. It is necessary to define specific business goals that need to be achieved thanks to the implementation of digital technologies, as well as specific results that must be achieved.

2. Key processes and functions. It is necessary to define key business processes and functions that will be optimized thanks to the implementation of digital technologies.

3. Systems and technologies. It is necessary to define the necessary systems and technologies that will be used to achieve goals and results.

4. Competencies and skills. It is necessary to define what competencies and skills are needed for successful implementation and use of digital technologies.

5. Organizational culture and changes. It is necessary to define what changes in organizational culture and structure are needed for successful implementation and use of digital technologies.

6. Expenditures and budget. It is necessary to define the necessary expenditures and budget for successful implementation and use of digital technologies.

7. Measuring results and effectiveness. It is necessary to define what metrics and indicators will be used to measure results and effectiveness of digital technology implementation.

The target model of managing digital transformation should be flexible and adaptive to changes in the market and internal needs of industrial enterprises, as well as oriented towards achieving specific business goals and results. It should be continuously improved and measurable to ensure the effectiveness of digital technology implementation and increase competitiveness in the market.

V. The organizational structure for managing digital transformation may vary depending on specific needs and goals of the industrial system. However, in general, it may include the following main elements:

1. Digital office. This is a department responsible for the development and implementation of the digital transformation strategy. The digital office may include specialists in various fields, such as analytics, development, testing, implementation, and training.

2. Digital committee. This is a committee responsible for making strategic decisions related to digital transformation. The digital committee may consist of representatives from different departments and areas, as well as external experts.

3. Digital groups. These are groups responsible for the development and implementation of specific digital projects. Digital groups may include specialists in various areas, such as analytics, development, testing, and implementation.

4. Digital leaders. These are highly qualified specialists responsible for leading and coordinating digital projects in the enterprise. Digital leaders should possess not only technical knowledge but also be able to manage people and projects.
5. Digital experts. These are specialists who have deep knowledge and experience in the field of digital technologies and innovations. Digital experts may work as internal employees or be hired as external consultants.

L. Lohoff and colleagues [29] note that, striving for ambidexterity, that is, simultaneous use of existing and creating new resources and opportunities, industrial enterprises create digital innovation departments (digital innovation units) that deal with digital innovations. Digital innovation units can operate separately from existing structures and take different forms of organization and functioning, depending on the specific needs and tasks of the enterprise. For example, they can be organized as separate units within the enterprise working on specific projects, or as independent startups with their own ecosystem and financing [30-35].

VI. Diagnosing the current level of digitalization of the industrial system allows to determine how effectively digital technologies are implemented and what improvements can be made to business processes to increase the efficiency of economic activity and improve business processes in enterprises and industrial sectors.

VII. The toolkit for managing digital transformation may include various tools and technologies that will help the industrial system successfully implement and use digital technologies to optimize business processes and achieve business goals. Often, researchers interpret Industry 4.0 concepts and approaches to digital transformation as synonymous or as a set of similar management tools. However, the implementation of digital technologies is not mandatory within Industry 4.0.

VIII. Supporting processes for managing digital transformation include various staffing, financial, infrastructure, security-related, and other processes that are necessary for the successful implementation and use of digital technologies in the industrial system.

IX. The action plan (roadmap) for managing digital transformation should include a sequence of steps necessary for the successful implementation and use of digital technologies in the enterprise. The digital roadmap should be developed to achieve digital business strategies that specify targeted transformation [36].

X. Managing digital transformation may be associated with some risks that need to be considered when developing a strategy and action plan. The key risks of managing digital transformation may include:

1. Technical risks. The introduction of new digital technologies may be associated with technical risks such as incorrect system configuration, software malfunctions, data security issues, etc.

2. Organizational risks. Digital transformation may lead to changes in the organizational structure, business processes, and the culture of the enterprise. This may be associated with organizational risks such as employee resistance to changes, difficulties in coordinating projects, communication problems, etc.

3. Financial risks. The implementation of new digital technologies may require significant financial investments. This may be associated with financial risks such as inefficient use of funds, budget management issues, inadequate assessment of economic efficiency, etc.

4. Security-related risks. Digital transformation may lead to an increased threat of cybersecurity and data leakage. This may be associated with risks such as breach of data confidentiality, theft of personal data, violation of legislation, etc.

5. Personnel-related risks. The implementation of new digital technologies may require retraining and requalification of employees. Personnel-related risks may arise such as a shortage of qualified personnel, difficulties in recruiting and training personnel, employee dissatisfaction, etc.

To minimize the risks of managing digital transformation, it is necessary to conduct regular risk assessments and develop strategies for managing them. It is also important to...
assess the economic efficiency of the implementation of new digital technologies and evaluate their impact on the organization as a whole.

XI. Evaluating the effectiveness of managing digital transformation is a necessary condition for the successful implementation and use of digital technologies in the enterprise. It allows to determine the directions of further development and optimization of business processes, as well as to improve the digital transformation strategy as a whole.

Thus, the systemic concept of managing the digital transformation of economic activity of industrial enterprises includes many elements such as goals, objectives, principles, target model, organizational structure, diagnosis of the current level of digitalization, toolkit, supporting processes, action plan, risks, and evaluation of effectiveness. Each of these elements has its own importance and role in ensuring the successful digital transformation of industrial enterprises. The concept of managing digital transformation helps organizations to determine their goals and objectives, as well as to choose appropriate tools and methods to successfully implement and manage the digital transformation of economic activity of industrial enterprises.

5 Conclusion

A concept of managing the digital transformation of economic activity of industrial enterprises has been proposed, within which a new type of management has been identified - digital management, based on a digital platform and intellectual knowledge. The main goal of managing the digital transformation of economic activity of industrial enterprises is to increase the efficiency and quality of services provided, their accessibility and capitalization growth, as well as to fulfill the social function of the industrial system in existing economic conditions and market models. The main problems faced by industrial enterprises in the process of managing digital transformation are identified, such as a shortage of qualified personnel, complexity of implementing new technologies, and high costs of digital transformation. Overall, digital management allows solving these problems and providing more effective management of industrial enterprises in the conditions of modern digital economy.

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