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Approaches to Digital Transformation of Energy Companies

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Abstract: In the context of the active use of digital technologies in the energy industry, many questions arise related to the choice of an approach to the implementation of digital transformation of business processes of an enterprise in order to realize all its competitive advantages. This article examines the approaches and main tools for the digital transformation of enterprises in the energy sector of the Russian economy. The authors analyze the current level of use of popular digital technology tools in various sectors of the Russian economy. The main stages of digital transformation of energy companies are highlighted. Proposals are formulated to improve the efficiency of using neural networks and machine learning in the energy sector for the safety of the energy system, automation of inventory management processes, and optimization of procurement activities.

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1 INTRODUCTION

The electricity industry is currently undergoing significant transformations caused by geopolitical and economic changes. There is fragmentation of markets, separation of production and supply, an increase in initiatives and projects for the generation of electricity from renewable energy sources and a growing focus on environmental protection. The results of numerous studies indicate that in an attempt to adapt to the rapidly changing external environment, energy sector companies are changing their business models, increasingly basing them on digital transformation solutions (Chwiłkowska-Kubala et al . 2023). However, Trzaska's research et al . (2021) show that the implementation of changes in energy companies may require a longer period of time due to specific features of the industry, such as the costly nature of the network infrastructure, the presence of natural monopolies whose operational structure limits innovation, and the need to take into account the transformation process in other sectors involved in energy production. This confirms the relevance of this study within the industry, which includes energy sector enterprises related to the production, distribution and supply of electricity, as well as enterprises directly or indirectly involved in the listed processes. These include companies manufacturing electric power equipment, designing and carrying out construction and installation works, service and maintenance organizations.

he study's practical significance lies in its contribution to the long-standing need to transform the business models of energy companies, moving beyond a mere adoption of digital technologies. This is not, in itself, a process of digital transformation; rather, it entails a comprehensive reconstruction of the business model, thereby elevating the company to a wholly different level of development. Consequently, issues of research and development of approaches to digital transformation to use new business opportunities are becoming important in energy companies today.

The objective of this study is to identify, based on literary sources and research by scientific communities, the processes and approaches employed in the digital transformation of enterprises, their systematisation, and the identification of features that can subsequently be taken into account when developing a business model for the digital transformation of an energy company.

2 MATERIALS AND METHODS

The purpose of the study is to examine the specifics of applying strategic planning for information security risk management. Despite the rapid development of digital technologies, the emergence of a large amount of software in various sectors of the economy, support for this activity by the state in the form of an offer for enterprises to participate in projects and programs, different sectors of the economy assimilate innovative technologies at different speeds. This is due to both the specifics of the resource provision of the industry and the nature of the activities of enterprises in the industry, the level of competition in the market, the infrastructure used and the qualifications of personnel. Research has shown that energy companies are slower to undergo digital transformation than enterprises in other industries (Maroufkhani et in 2022; Sebastian et al 2017). For this purpose, this article analyzes the experience and approaches to digital transformation of enterprises in different industries using case methods, by analyzing the approaches to digital transformation they use, as well as the identified advantages and disadvantages of these approaches.

The main methods used in conducting this study are the analysis of enterprise cases, scientific research, synthesis and systematization of data, and methods of classifying objects.

3 RESULTS

When considering the issue of implementing digital tools, we can note a large number of publications based on studies of their application in various industries. It is necessary to understand that the use of one type of such technologies or even a combination of types by an enterprise does not determine whether the enterprise is at the stage of digital transformation or is going through the stage of digitalization of individual activities. To do this, it is necessary to conduct an in-depth analysis of the company's activities and consider the approach used by the enterprise to change its business model. It is important to note that the use of one type of digital technology, correctly applied within all involved business processes, and changing the company's business model, already allows us to talk about digital transformation. At the same time, there are

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studies that focus on the use of individual software products within the digital transformation process. Therefore, we also took such cases into account and identified them as a point approach within the digital transformation of enterprises. It can be noted that certain types of software products allow you to transfer certain actions in different functional units to the digital space and thus obtain a point-distributed approach.

A more advanced method of digital transformation is the digitalization of individual functions, processes or projects. If we look at the activities of an enterprise as a set of certain functions and processes, we can assume that the digitalization of one function or process will entail further activities for the digital transformation of the entire enterprise, involving all processes and functions in the chain. Moreover, the speed of their digital transformation will depend on such factors as the number of points of interaction with processes that have already undergone digital transformation and the level of qualification of personnel (process participants). Digital transformation based on a project approach, in this case, involves the use of digitalization within a project. Currently, more and more enterprises are organizing project teams as part of their core business, and work in each specific project may differ from another project in the same company. Digitalization of project work allows you to plan and track the progress of the project, visualize and exchange data, prepare reports with greater speed and accessibility for all project participants.

A systemic and comprehensive approach to digital transformation already represents a level of digitalization that changes the company's business model. All functions, processes and projects of the company are involved here. At the same time, a systemic approach involves only internal stakeholders, and a comprehensive approach also involves external ones. With a comprehensive approach, all partners and other interested parties are involved in digital transformation in such a way that a digital ecosystem is created, the core of which is the company initiating the digital transformation process. Currently, a comprehensive approach is mainly used by banks, forming an ecosystem and involving their consumers in this process. However, in many companies, digital transformation does not go beyond the processes of digitalization of financial transactions, which for them is a point or functional approach.

The results of the classification of approaches to digital transformation are presented in Table 1, which also briefly presents the advantages and disadvantages of the identified approaches.

Table 1: Classification of approaches to digital transformation of companies.

Approach	The essence of the approach	Advantages	Flaws
Point	Individual attempts to digitalize certain jobs within different processes and functions	Small financial investments, training of certain employees	In general, it is not a digital transformation of the enterprise as such, especially at the initial stage
Point-distributed	Individual attempts to digitalize certain similar works within different processes and functions	Small financial investments, training of certain employees	In general, it is not a digital transformation of the enterprise as such, especially at the initial stage
Functional	Complete digitalization of a specific function	Increased productivity in a specific area of work, freeing up resources. No large simultaneous investment of resources is required with the consistent digitalization of functions	Lack of integration with other functions during consistent digitalization of functions
Process	Complete digitalization of the process (when a company applies a process approach in its activities)	Digitalization of all significant actions: planning, information exchange, implementation of certain stages, preparation of	Lack of or incomplete integration with other processes and functions in the company during the consistent digitalization

		reports.	of processes
Project	When implementing a project, software products are introduced that help to implement the project faster, better and more efficiently.	Digital planning, visualization and exchange of project data, reporting	Once the project is completed, it may not spread to other projects or processes of the company.
Systemic	Based on the digitalization of all processes and functions of the enterprise	Increased productivity, emergence of “reserves” of various types of resources	Involves all staff; quite expensive process; entails revision of further work with business partners.
Complex	It involves taking into account the interaction of internal and external environmental factors that determine the formation of a comprehensive benefit	Increased productivity and improved customer satisfaction throughout the supply chain; The emergence of “reserves”, both temporary and cost-based, for revising pricing policies; Implementation of the "one window" principle	An expensive process that requires large investments of resources. The transition is time-consuming and requires complete retraining of personnel, as well as the involvement of partner companies in this process.

Based on the proposed approaches to digital transformation, one can also classify the levels of digital transformation:
1) international
2) state
3) regional
4) industry (the level of several partner enterprises of the same industry)
5) inter-industry (the level of several partner enterprises from different industries)
6) micro level (enterprise level)

An integrated approach involves work at the industry or inter-industry level, as it involves many partner enterprises in this process. A systemic approach is presented at the micro level, as it involves all departments of one enterprise. At the same time, project, process, functional, point and point-distributed approaches can be applied at different levels, as they are associated with the implementation of certain software products in individual elements of the work of both one enterprise and different types of organizations: state and non-profit, as well as international companies.

4 DISCUSSION OF RESULTS

Let us highlight the main reasons for failures in the digital transformation of enterprises:
1) lack of sufficient level of staff competence
2) unpreparedness of current business processes for transformation
3) unwillingness to invest large amounts of resources in digital transformation;
4) management lacks a clear understanding of the time costs of this process.

It should also be noted that this process proceeds at different speeds and efficiencies in different sectors of the economy. For example, there is a high demand for certain types of digital technologies in the fuel and energy sector. On average, it is higher than in other industries under study. However, not all types of digital technologies are in demand, which in essence can only mean insufficient advertising, poorly presented applicability of a particular type of technology in the industry. It is also necessary to understand that the use of one type of such technologies or even a set of types by an enterprise does not determine whether the enterprise is at the stage of digital transformation or is going through the stage of digitalization of certain types of activities. To do this, it is necessary to conduct an in-depth analysis of the company's activities and consider the approach used by the enterprise to change its business model. It is important to note that the use of one type of digital technology, correctly applied within the framework of all involved business processes, and changing the company's business model, already allows us to talk about digital transformation.

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5 CONCLUSION

Thus, the prospects for digital transformation of electric power companies are very encouraging. However, successful application of a systemic or integrated approach requires access to a sufficient amount of data and highly qualified specialists in the field of digital tools. These technologies can improve efficiency and optimize company processes, as well as reduce costs. However, for successful implementation of digital transformation, it is necessary to take into account all aspects and risks, and ensure data security. The purpose of digital transformation is to functionally assist specialists and achieve the best solution to the tasks set.

The use of digital tools in the energy sector can lead to increased efficiency and safety of the energy system, which is an important factor in ensuring the sustainable development of modern energy. The issues of digital transformation of enterprises, the approaches and methods used to implement this activity, the organization of the transformation process and resource provision remain open for further research. Achieving the goals of sustainable development of enterprises seems almost impossible without digital transformation of the energy industry.

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