

APPLICATION OF PROJECT MANAGEMENT METHODS BY INDUSTRIAL ENTERPRISES IN THE CONTEXT OF DIGITALIZATION OF THE ECONOMY

Przedsiębiorstwa w kontekście cyfryzacji gospodarki

¹ Doctor Phd, Associate Professor of Karaganda Buketov University, Kazakhstan; nurg_78@mail.ru; ORCID 0000-0001-8250-4111

² 1 year Master's student of Karaganda Buketov University, Kazakhstan; sholpan.kusaynova.00@mail.ru

Annotation.

Project management methods are analyzed from the point of view of their applicability by industrial enterprises operating in the conditions of digitalization of the economy. One of the variants of application of project management methods at industrial enterprises performing the task of informatization of the production process is proposed. The use of project management methods facilitates the adaptation of enterprises to changing environmental conditions caused by the active development and implementation of information technologies and digitalization of society, allows you to identify and make the most complete use of available resources, make effective management decisions, and establish interaction between departments performing various functions. The process of applying project management methods should be carried out taking into account the goals defined by the enterprise strategy, as well as trends in changing environmental conditions.

Adnotacja.

Metody zarządzania projektami są analizowane z punktu widzenia ich przydatności przez przedsiębiorstwa przemysłowe działające w warunkach digitalizacji gospodarki. Zaproponowano jeden z wariantów zastosowania metod zarządzania projektami w przedsiębiorstwach przemysłowych realizujących zadanie informatyzacji procesu produkcyjnego. Zastosowanie metod zarządzania projektami ułatwia dostosowanie przedsiębiorstw do zmieniających się warunków środowiskowych spowodowanych aktywnym rozwojem i wdrażaniem technologii informatycznych oraz digitalizacją społeczeństwa, pozwala zidentyfikować i jak najpełniej wykorzystać dostępne zasoby, podejmować skuteczne decyzje zarządcze oraz nawiązywać interakcje między działami pełniącymi różne funkcje. Proces stosowania metod zarządzania projektami powinien być realizowany z uwzględnieniem celów określonych w strategii przedsiębiorstwa, a także trendów w zmieniających się warunkach środowiskowych.

Keywords: *information technologies, industrial enterprises, digitalization, competitiveness, innovative development, project management, information resources, enterprise management*

Słowa kluczowe: *technologie informacyjne, przedsiębiorstwa przemysłowe, digitalizacja, konkurencyjność, rozwój innowacyjny, zarządzanie projektami, zasoby informacyjne, zarządzanie przedsiębiorstwem*

Introduction

Digitalization of the economy has a significant impact on the activities of domestic industrial enterprises and makes it necessary to adapt in a timely manner to changes caused by intensive technological development.

The relevance of the research is determined by the growing needs of domestic industrial enterprises for tools, the use of which contributes to increasing their competitiveness in the global market and digitalization of the economy. Changing external conditions require an appropriate response from companies and the search for new solutions that will allow them to maintain their position in the market.

In this article, project management methods are studied from the point of view of their applicability to the activities of industrial enterprises. Previously developed and proven project management methods can be successfully used not only for the development of project activities, but also as tools in the field of industrial enterprise management.

The development of industrial enterprise management methodology can be an effective tool for enterprises to achieve their goals and implement strategic plans. The use of project management methods by industrial enterprises contributes to more efficient use of the resources available to them, and helps in identifying additional ways to achieve their goals. The results of this study can be useful for senior and middle-level managers involved in the processes of enterprise development and improvement of production activities.

It should be noted that the possibilities of applying project management methods in the practice of domestic enterprises are currently significantly underestimated. In the context of digitalization of the economy, which leads to tougher global competition, the development of topics related to the search and expansion of tools in the field of effective management of industrial enterprises is constantly increasing. The application of project management methods can be appropriate both within the entire industrial enterprise, and in the activities of individual and specific structural divisions.

Information technologies in the development of industrial enterprise management methodology

The need to maintain competitive positions in the market in the context of the active development of information technologies makes it necessary to make changes in the production and management activities of industrial enterprises.

The development of industrial enterprise management methodology is currently directly related to the development and implementation of information technologies. Their use helps to improve the efficiency of the implementation of individual methods.

Commercial organizations that implement projects in the context of digitalization of the economy are actively using the following promising methods:

- Waterfall model Waterfall, in which the task moves sequentially from one stage to another.
- a flexible project management model that allows dynamic requirements formation (Agile);
- hybrid approach that combines techniques used in waterfall and agile models – Scrum methodology, which involves a special organization of the work of teams of employees;
- Japanese philosophy and practice of “Kaizen” (Kaizen), focused on joint, continuous management and improvement of processes and activities of teams;
- the Kanban method in which information about the project is visualized as much as possible, which allows you to see overlays and errors, work on the task is carried out simultaneously by the entire team in order to avoid uneven load distribution, and the time for completing tasks is strictly controlled [1];
- methodology for improving the efficiency and organization of DevOps software development and operation processes DevOps (English DEVelopment OPeration);
- the Lean manufacturing approach, manufacturing which involves minimizing the resources spent;
- The Critical Path Method (CPM) Path Method, which is used to simulate the process.
- the ECM event chain methodology methodology, which involves predicting and managing the occurrence of events.
- the Program Evaluation Review Technique (PERT) Review Technique, which pays special attention to the analysis and prevention of the impact of risks;

- The CCPM critical chain project management method, which takes into account constraint theories.
- the Six Sigma method Six Sigma, which applies an approach to improving the production process by searching for and eliminating the causes of errors or defects in business processes;
- Projects in Controlled Environments PRINCE2; Projects in Controlled Environments PRINCE2);
- Process-based Project Management; Process-based Project Management);
- use of key performance indicators (KPIs). Indicators).

All of the above methods can be implemented using information technology. For this purpose, you can use both specially developed software and devices that perform certain functions. The introduction of information technologies in management processes leads to an increase in planning efficiency, acceleration of production processes, improvement of the quality of goods and services offered, improvement of logistics processes and commodity movement processes in general, and increased control efficiency [3].

The use of information technologies allows solving problems that arise as a result of the emergence of new innovative solutions. The range of application of information technologies in the application of industrial enterprise management methods is very wide. For example, they can be implemented using developments in the field of blockchain, artificial intelligence, the Internet of Things, and cloud technologies. To date, the implementation of distributed cloud technologies has begun, in which data is stored on various servers distributed in the network, and architecture management, administration and updating remain the responsibility of the provider of public cloud services. In the practice of industrial enterprises, the development and use of digital twins is becoming increasingly important. Information technologies play a key role in the progress of the modern economy. Modern information technologies are used for efficient and timely computer processing and sorting of information resources, their transmission over various distances in the shortest possible time.

The development of the methodology for managing industrial enterprises takes place in the context of the introduction of modern technologies and is influenced by them. There is a reciprocal process. Information technologies are used to implement existing project management methods, and, at the same time, by changing the technology of the process and method, they lead and make it possible to transform them, integrate them with other methods, or expand the scope of application, as for example, in the case of using proven project management methods in the activities of industrial enterprises. Introduction of information technologies is one of the most effective means

to maintain and strengthen its advantages over competitors. It facilitates the process of finding new ideas, allows you to implement previously non-existent opportunities.

Possibilities of applying project management methods in the practical activities of domestic industrial enterprises

In the practical activities of industrial enterprises, the use of project management methods may be appropriate for solving specific problems, they can be used to increase the level of adaptability of the enterprise to changing external conditions.

As an example of such an application and as part of the study of the possibilities of applying the methods, we will consider one of the options in which an industrial enterprise faces the task of informatization of the production process.

In this case, it is advisable to use the following methods.

1. Cascade method (Waterfall). The implementation of this method involves passing the task sequentially in stages that resemble a stream [7]. In the case of the implementation of the task of informatization of the technological process, it consistently passes through the stages from determining the requirements for the results of work to the functioning of the modified production process. As an advantage of this method, we should note the tendency to perform work within the planned plan, which prevents the need to change the amount of financial resources and postpone the established deadlines.
2. Flexible project management model (Agile). An approach to the implementation of works focused on the use of the iterative principle of work implementation, dynamic formation of project requirements with constant interaction of the customer's representative with a self-organized team consisting of specialists of various profiles [7]. As part of the implementation of the task of informatization of the production process, the planned activities are divided not into consecutive phases, but into separate tasks, the implementation of which leads to the required result. Initiation and top-level planning cover the entire task, and subsequent stages: development, installation of equipment on various lines, testing of individual blocks, and other actions are performed separately for each mini-task. This makes it possible to transmit the results of such mini-tasks faster, and when starting a new task, it remains possible to make changes without affecting the rest of the work and significantly changing costs.

The advantage of this method in implementing the task of informatization of the production process is the ability to quickly make changes to the management decision-making process and maintain the ability to quickly implement advanced technologies.

3. I'm cutting-edge tech. The Program Evaluation Review Technique (PERT) Evaluation Review Technique allows you to quantify the expected duration of the entire project and its individual components [2]. As part of the implementation of the task of informatization of the production process, the use of this method allows you to plan the full cycle of operation of the installed equipment, its application also makes it possible to plan the life cycles of both individual manufactured goods and their lines, and the entire enterprise as a whole. In modern conditions, the use of this method can be implemented simultaneously with the creation of digital twins, the installation of specialized software, the development and use of cloud technologies and the Internet of Things.
4. The Critical Path Method. Critical Path Method This method allows you to manage projects related to the technological modernization of the enterprise through the implementation of the modeling process, that is, a project model is created that includes such mandatory elements as operations and processes that interact with each other during the project, the time of project implementation and its components [2]. Based on mathematical calculations, the constructed model allows you to identify which of the sequences of operations and events is the longest in terms of execution time. In addition, this model allows you to determine the least and most time-consuming options for the start and end of each of the project operations, which will not lead to a significant delay in the implementation of the project as a whole [5]. Thus, when managing the technological modernization of domestic enterprises and as part of the implementation of the task of informatization of the technological process, the use of the critical path method makes it possible to optimize the decision-making process and reduce possible risks. In the practical activity of domestic industrial enterprises, the use of this method is applicable to the implementation of production modernization activities, the need for which is constantly increasing in the context of intensive technological development. This technology is applicable in the process of implementing distributed cloud technology. In modern conditions, the use of this method can be implemented simultaneously with the creation of digital twins.

Методика The Scrum methodology developed by J. R. R. Tolkien Sutherland and K. The mop maker. The difference between this method is the possibil-

ity of its application in activities involving active collective work. This method is effective for projects that require fast results [6]. Translated from English to Russian, the term “scrum” means “scrum”. The direction of development of the enterprise, the nature of innovations and the efficiency of the enterprise as a whole completely depend on the work of its employees. In this regard, the development of methods for organizing effective team work is also relevant for industrial enterprises. The use of this method in the implementation of the task of informatization of the production process can be effectively used when employees of different structural divisions search for optimal technological solutions and in the process of their implementation in practice.

Thus, project management methods can be effectively applied in the activities of industrial enterprises. The advantage of improving the management methodology by complementing it with project management tools is that it allows you to take into account the specifics of a particular enterprise, and make better use of its available resources.

For the purpose of informatization of the production process, it is possible to use both separate methods and their combination, depending on the specifics of the activity and resources of a particular enterprise.

The application of project management methods in the practical activities of domestic industrial enterprises expands their capabilities, increases the level of flexibility of the management system, accelerates the introduction of necessary changes in production processes, and allows them to reveal their intellectual and technological potential.

Analysis of results

Innovative development is a prerequisite for timely response to environmental changes, which are characterized by high dynamics of transformation and digitalization of society. The results of innovative activity and the use of modern management methods allow enterprises not only to maintain strong positions in the market and provide the necessary financial indicators of the business, but also to optimize internal business processes, identify reserves for development, and enable them to move to a qualitatively new level of functioning.

Continuous technological improvement is now becoming a necessity. Technology acts as an objective, materially organized form of innovation existence [4]. Changing external conditions require an appropriate response from companies and the search for new solutions that will allow them to maintain their position in the market. The use of proven project management methods can be an effective tool, including for industrial enterprises.

In conditions when industrial enterprises are faced with the task of increasing the level of informatization of production processes, it is possible to combine a number of methods or use their individual elements that correspond to the goals set. Options for combining methods depend on the specifics of a particular enterprise. One of these options is described in this article.

Project management methods are actively and successfully applied in such foreign companies as Daimler (manufacturer of Mercedes-Benz cars), Suzuki, Toyota, Samsung, Panasonic [8-12]. The results of the analysis of the activities of these successfully operating foreign industrial companies in the market allow us to conclude that it is advisable to apply project management methods in the practical activities of domestic industrial enterprises. In a generalized form, the opportunities opened up by the use of project management methods in the activities of domestic industrial enterprises can be characterized as follows (Table 1).

Many methods were initially formed under the influence of intensive development of information technologies and can be applied in conditions of active digitalization. The use of proven project management methods can be an effective tool for solving problems facing industrial enterprises. The use of such methods contributes to expanding the capabilities of enterprises and their adaptation to changing conditions. Their application in practice helps to identify unused resources of the enterprise, facilitates the process of making managerial decisions, and contributes to the achievement of strategic goals of the enterprise.

Application of project management methods in the activities of domestic industrial enterprises

Наименование Method name	Method essence	Areas of application in the practice of industrial enterprises	Advantages of using the method in industrial enterprise management
Waterfall model Waterfall	The task is passed sequentially in stages, according to the flow principle	Management of the enterprise and its structural divisions, improvement of the system of interaction with the consumer of manufactured products	Manage the execution of work in accordance with the agreed plan. Compliance with the cost estimates and deadlines for the implementation of activities.
Agile Project Management Model Agile	Splitting a task into multiple parts in order to organize parallel work on their implementation	Management of the enterprise and its structural divisions, implementation and work with electronic information systems	Rapid introduction of changes in the management decision-making process, adaptation of the production process to the rapid emergence of new technological solutions

PERT program and Project Evaluation and Analysis techniques	Quantification of the expected duration of the entire project and its components	Implementation of specialized software, creation and use of digital twins, development and use of cloud technologies and the Internet of Things	Planning of a full cycle of operation of the installed equipment, planning of a life cycle of the enterprise, and also products made by it
Critical path SRM Method	Creating a model for optimal sequences of operations and events	Production processes, modernization of technological cycles	Management of activities related to modernization of production, improvement of technological cycles, introduction and use of information technologies
Методика Scrum Methodology	Building a special organization for the work of teams of employees	Organization of team work, solving short-term tasks, quality management	Improvement of methods of collective work, determination of the direction of further development, search and selection of technological solutions

Conclusion

To survive in the global market and continue to develop sustainably, domestic industrial enterprises need to identify opportunities for the most complete use of available resources. The use of proven management methods used in project management can be effective and appropriate in the activities of industrial enterprises operating in the context of active digitalization of the economy.

To identify the possibilities of using project management methods in the activities of industrial enterprises, an analysis was carried out, which resulted in the first identification of areas in which such application becomes possible and appropriate.

The application of project management methods in the activities of industrial enterprises contributes to the development of new areas of activity, the search for ways to overcome modern challenges, and the implementation of previously formed strategies. In the process of introducing new products to the market, high-quality testing methods that precede mass production and help minimize risks are of particular importance for industrial enterprises. To solve a specific problem facing an industrial enterprise, it may be advisable to use either one proven method developed in the framework of project management, or a combination of them or a combination of several methods.

The current conditions of rapid digitalization of the economy and the ongoing globalization of the market make it necessary for industrial enterprises to find and apply new methods that correspond to the current situation. In this capacity, proven project management methods can be used. The use of such methods makes it possible to make the process of managing an industrial enterprise more flexible and adaptive, which is especially important in conditions of economic crises, rapid changes in market conditions and digitalization of the economy.

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