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## **SYSTEM SOLUTIONS FOR THE DEVELOPMENT OF PROJECT MANAGEMENT AT THE ENTERPRISES OF THE DEFENSE INDUSTRY COMPLEX OF THE REPUBLIC OF KAZAKHSTAN**

**Abstract.** This article is devoted to studying the features of ongoing projects at the enterprises of the military-industrial complex of Kazakhstan and identifying opportunities for the implementation of project management information systems (PMIS) in this industry. To achieve short-term and long-term goals, companies work on many logical tasks. The operational management process is an essential component of an enterprise management system. An increasing number of enterprises (if not all) of various fields of activity, identify project activity as an important and specific part of management. And the process of managing the activities of modern enterprises is increasingly based on the use of digital technologies.

Current trends in the development of the military-industrial complex (MIC) determine the need to involve the potential of digital technologies, however, the lack of resources and mechanisms associated with system solutions for defense industry enterprises, require the involvement of existing and effectively functioning software products in this process.

In this regard, the authors analyzed the essential project management software products, studied the implementation process of the project management information system, and described the implementation stages and possible problems that managers most often encounter when implementing the PMIS.

**Keywords:** defense industry, project management, defense projects, information system.

Today, project activities in one or another form exist in almost any enterprise. Company management is aware of the complexity of project management tasks and identifies project activities as an important and specific part of their activities. Companies in the defense industry use foreign experience in implementing a management system, taking into account their own insignificant domestic market, which requires modern management approaches and the use of information and analytical management systems. Accordingly, modern management approaches and the implementation of information-analytical management systems are required [1].

The military-industrial enterprises of Kazakhstan are characterized by the fact that they produce not only specialized military products but also civilian products. Resulting in various projects are being implemented aimed at developing armament and military equipment (AME), dual-use and civilian products, after-sales service of production machinery and equipment, as well as modernization of the enterprise itself. Project implementation includes many integral and interconnected stages, groups of skilled workers, subcontractors, task management, maintenance, planning, budgeting, problem-solving, and overall coordination of efforts to achieve the successful completion of the relevant results on time, within the budget, and corresponding quality.

**Current status of project management development.** At domestic enterprises, projects are carefully planned and implemented. However, there is a problem that not a single project of any value is fully implemented as planned [2]. The project management team uses resources, such as flow charts, Gantt charts, project schedules, presentations, and other tools to plan, monitor, identify problem areas, take corrective actions, create project status reports and make adjustments to the project plan as needed throughout the project life cycle for effective and efficient project management.

The main resource intensive action is to conduct meetings and approval of relevant documents.

The project manager is responsible for the implementation of the project. The main functions of the project manager are the implementation of planning the activities of all the “necessary” specialists and the management of the “necessary” processes. The challenge is to transform project plans and schedules into specific, interrelated tasks, and then assign the “necessary” resources to complete these tasks. Resource allocation, timing, evaluation, and adaptability are critical. However, project managers have difficulty in accurately predicting resources, and the time it may take to complete a common job or even specific tasks. In some cases, the available resources are not used enough, which leads to the inefficiency of the project. In other cases, resources are overspent, resulting in delayed schedules.

**Methods and tools.** In modern conditions, the issue of continuous improvement of management effectiveness is of particular importance. The key objective of effective management is the formation, implementation, and use of an integrated results management system that takes into account and promptly responds to dynamic changes in the internal and external environment [3].

Project management information systems are a comprehensive tool to provide support for the project life cycle, effective planning, and management of work progress, compliance with predefined standards and requirements.

The integration of project management systems in the enterprise requires the creation of certain conditions that allow to fully realize the capabilities of the entire enterprise management system. Separate methodological, instrumental, and other tools essential for successful project management have to be combined into one system within which project manager and team's tasks would be solved with greater efficiency. In other words, the creation and provision of conditions for the integrated project management system are essential. This is especially important for performing large-scale projects, or at enterprises that are constantly engaged in project activities.

**Current solutions.** The modern activity of enterprises requires the creators of information products to develop high-quality systems within the allocated budget and on time. Various specialists participate in the creation of information software products, which are united in teams. An effective solution to the problems of creating high-quality software involves the use of tools, techniques, and technologies for managing the processes of the life cycle of software systems (the formation of requirements, modeling, and design, development, testing, construction and deployment of systems) [4]. That is, in principle, any enterprise, taking into account its conditions of functioning and activities, can determine for itself which information software product is needed to improve project management efficiency, but here it is necessary to determine the following motives:

- how unique is the activity of the enterprise;
- the number and scale of enterprise projects;
- value in the in-house development of information products;
- personnel and innovation potential.

Project management in practice in larger projects, due to the "high" requirements, is possible only with the support of PMIS. Way or other, project managers will use various solutions, tools, software applications that offer a wide range of functions in the areas of project planning, monitoring, and continuous evaluation of project implementation, as well as final evaluation upon completion. In this aspect, domestic as project managers, and their executors, in principle, find solutions to the problems of storage, coordination of information, etc.

An important function of the project management information system is the ability to continuously exchange data regarding ongoing projects among the project team and their environment (subcontractors, customers, and other persons interested in the project). The main value in project management information systems is the provision of objective data to support management decision-making on ongoing projects.

When implementing and/or integrating them, it is worth considering how developed or available software supports the project management methods defined in the project management methodology at the enterprise, how much resources will be required to support these tools, what additions can be given at certain stages of the project's life cycle, and whether the application of the system is sufficient from the point of view of quality project management [5].

There are dozens of complex project management systems. The most common software applications are Microsoft Project [6], Primavera Project Planner [7], Spider Project [8], Open Plan [9], and others, which are also lighter applications based on cloud solutions.

**The effectiveness of information systems for domestic enterprises.** The main planning method used in project management is the critical path method (CPM). Several existing software applications, such as Microsoft Project and Primavera P3, implement the traditional theory of project management CPM-PERT [6,7]. But, the value for domestic managers in the military industry is not to determine the critical path, since plans are formed at a "high" level, in the form of "road maps." Specific plans for calving or specialists are formed based on roadmaps.

The above software applications allow you to receive data about tasks, such as duration, start date, end date, and resources (see what human resources are involved). As the project progresses, you can enter information on actual results, as well as develop and present information regarding the effectiveness of the project at the current date, after which the system analyzes and generates reports.

Inside the project, tasks are assigned resources that implement an algorithm for calculating the critical path to form a Gantt chart, taking into account the indicated volumes of expended resources. Using the algorithm for calculating the critical path, projects fall into at least one path between the beginning of the program, and its completion [10].

The above tools allow managers and executives to define one or more "work breakdown structures" for the implementation of a project into which "separate" resources can be assigned at a certain level. Also, information systems provide for the calculation of trends in success probabilities, revenue modeling, and calculation of Cash Flow which, facilitates and/or replaces the work of risk managers and financiers.

The use of information systems essentially reduces the time spent on briefings and meetings, which is held by the leadership, and using "visualized boards" during a meeting increases the productivity of meetings manifold. Unfortunately, holding meetings at the moment is a necessary measure to monitor ongoing projects and tasks because most domestic military-industry enterprises lack the appropriate equipment and software applications. And therefore, monitoring practice prevails through meetings, memos, reports, etc.

**Implementation of project management information systems.** PMIS is usually acquired by enterprises in the form of software packages. For their installation, a team of IT managers and integrators is required. Each software in the package has its purpose, function, and in the complex are intended to provide managers with the decision support they need when planning, organizing, and monitoring projects.

Before installing software for the formation of PMIS, it is recommended to carry out preparatory diagnostic work, which consists in analyzing the functionality of all the project management systems listed above, building a model of business processes for the project activity of the enterprise and, based on this, drawing up the technical assignments for the development of the module "Project Management" (PM) PMIS.

Analysis of the functional capabilities of the PMIS includes the organization of presentations of the issue solution, the collection, and processing of information about the work and technical requirements of the software product, risk analysis, and so on. Based on a survey of the enterprise's activities, it is possible to develop a model of the enterprise's business processes "as is" and "as it should be," which will facilitate the process of selecting PMIS. The project management module developed by the terms of reference acts as the basis of the PMIS, and the PMIS itself is formed only after setting the integration parameters of the project management module with all other PMIS modules.

The development and implementation of a corporate PMIS in a company is a complex of activities and is carried out in several stages.

Stages of development and implementation of the corporate project management system (CPMS)

Stage name	Result
Stage 1. Development of a corporate standard for project management in the enterprise	Project Management Framework: - Regulations defining the general structure of the enterprise project management system; - Methodological and regulatory documents on the necessary procedures and management functions; - Guidance on the use of management procedures and functions; - Templates of working documents of project management forms of management reporting.
Stage 2. Creation of a project office based on the network management group	Project Office (PO) - a unit that provides professional methodological, informational, administrative, and technological support for project management in the enterprise.
Stage 3. Identification of employees of the enterprise whose activities in the field of scheduling and project management must be transferred to the project management system (PMS)	PMS - module "Project Management" of the integrated enterprise management system and its support
Stage 4. Implementation of the "Project Management" module, installation and configuration of its technical support at the workplaces of project office employees and departments	Installation and configuration of technical support (equipment). Install and configure the software.
Stage 5. Training of employees, by their functional responsibilities in the design activities of the enterprise.	Further training of employees of the enterprise practical skills of work in the PMS.
Stage 6. Transfer of design activities of the enterprise to the PMS	Improving the efficiency of planning project activities at the enterprise. The use of modern software and hardware. Improving the protection of information from unauthorized access.

Having decided on the implementation of a PMIS, company management may encounter some problems that will require both strategic and operational solutions.

**Problems of implementation and integration of control systems.** It is essential to describe the algorithms for solving all the problems associated with the implementation before the process of implementing and integrating the PMIS. The main problems that management confronts include the following:

A) employees of an enterprise do not realize the necessity of introducing a "new" system and the work of the implementation group. It may be classified as open or hidden "sabotage";

B) The qualifications of the employees of the enterprise, those who are the end-users of the implemented system, who will interact with the system are low, which complicates the effective operation of the system;

C) the operation at the enterprises of outdated systems and software applications of their design, which cannot be completely abandoned or integrated with other systems.

D) the computer equipment does not meet the requirements of the modern PMIS - insufficient computer performance and low network bandwidth. Some modules of the PMIS are functionally full enough while some of them ready less than half of their functional part, require significant processing, scilicet do not meet the requirements (customer requirements) for the PMIS modules.

PMIS allows you to carry out scheduling and management of any projects of a enterprise, as well as generate and receive the required reports on them. The implementation of the PMIS ensures the adoption of informed and proven decisions, allows you to execute projects faster, better and with lower costs, as well as always have the most complete and varied information about ongoing projects.

**Conclusion.** Each project for the implementation of a corporate information system for project administration should be considered by the enterprise management in the context of the strategic investment of funds, improvement management processes, increment the efficiency of the enterprise, and lowering costs. The introduction of PMIS within the framework of an integrated enterprise management system is a very complex and time-consuming process. The main factors that have a significant impact on the timing and success of the implementation project include obtaining maximum information on the implementation PMIS:

- development of an enterprise project management methodology;
- analysis of all kinds of risks;

- a clear and high-quality description of all implementation procedures;
- essential for PMIS is a high-quality selection of implementation team members and training of this team and enterprise personnel.

PMIS provides planning of projects and resources, managing project teams, assessing risks, monitoring the progress of projects, forming managerial reporting, and monitoring the financial component of projects, which for long-term projects in the military industry is an important component for internal and external control. Thus, the Customer is the main interested party, represented by the Power Departments, which carry out the order and financing of the AME projects. However, the offer of a better approach to ongoing projects on the part of the MIC will also allow increasing loyalty to the domestic producer on the part of internal and external customers.

Thus, the project approach in the activities of enterprises at the present stage requires the use of modern tools and support systems. Developing your own or using existing ones requires certain approaches specified in this paper.

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#### **ҚР ҚОРҒАНЫС ӨНЕРКӘСІБІ КЕШЕНІНІҢ КӘСІПОРЫНДАРЫНДА ЖОБАЛЫҚ БАСҚАРУДЫ ДАМУДАҒЫ ЖҮЙЕЛІ ШЕШІМДЕРІ**

**Аннотация.** Бүгінде жобалау қызметі белгілі бір формада кез келген кәсіпорында бар. Кәсіпорын басшылығы жобаларды басқару міндетінің күрделілігін жете түсінеді және оны өз қызметінің маңызды, ерекше бөлігі ретінде көрсетеді. Қысқамерзімді және ұзақмерзімді мақсатқа қол жеткізу үшін компаниялар көптеген логикалық міндеттерді орындау негізінде жұмыс істейді. Операциялық қызметті басқару үдерісі кәсіпорынды басқару жүйесінің маңызды компоненті болып саналады. Түрлі қызмет салаларының көптеген кәсіпорындары (егер бәрі болмаса) басқарудың маңызды және ерекше бөлігі ретінде жобалық қызметті көрсетеді, ал қазіргі заманғы кәсіпорындардың қызметін басқару үдерісінің өзі цифрлық технологияларды пайдалануға көбірек негізделеді.

Қазақстанның ҚӨК кәсіпорындары тек әскери ғана емес, сонымен қатар азаматтық мақсаттағы арнайы өнімдерді шығару жағдайы сипатталады. Қазақстан Республикасының Қорғаныс өнеркәсібі саласында әскери техника мен қос мақсаттағы өнімдерді жобалауға және өндіруге, өндірілген техника мен жабдықтарға сервистік қызмет көрсетуге бағытталған жобалардың алуан түрлері іске асырылуда. Жобаларды іске асыру көптеген ажырамас және өзара байланысты кезеңдерді, білікті қызметкерлер топтарды, қосалқы мердігерлерді, міндеттерді басқару, техникалық қызмет көрсету, жоспарлау, бюджеттеу, мәселелерді шешу мен тиісті нәтижелердің өз мерзімінде, бюджет шеңберінде және тиісті сапада аяқталуына бағытталған күш-жігерді үйлестіруді қамтиды.

Мақала Қазақстанның қорғаныс өнеркәсібі кәсіпорындарында іске асырылатын жобалардың ерекшеліктерін зерттеуге және экономиканың осы саласында жобаларды басқарудың ақпараттық жүйелерін енгізу мүмкіндіктерін анықтауға арналған.

Қорғаныс-өнеркәсіп кешенінің дамуының қазіргі заманғы үрдістері (ҚӨК) цифрлық технологиялардың әлеуетін тарту қажеттілігін анықтайды, алайда ҚӨК кәсіпорындарында жүйелік шешімдерге байланысты ресурстар мен тетіктердің болмауы осы үдеріске қолданыстағы және тиімді жұмыс істейтін бағдарламалық өнімдерді тартуды талап етеді.

Жобаларды басқарудың ақпараттық жүйесі жобалардың өмірлік циклін қолдауды, тиімді жоспарлауды және жұмыс барысын басқаруды, алдын ала белгіленген стандарттар мен талаптарға сәйкестігін қамтамасыз етуге мүмкіндік беретін кешенді құрал болып саналады.

Кәсіпорында жобаларды басқару жүйесін ықпалдастыру кәсіпорынды басқарудың барлық жүйесінің мүмкіндігін толық көлемде іске асыруға мүмкіндік беретін белгілі бір жағдай жасауды талап етеді. Әдетте, жобаны табысты басқару үшін қажетті әдістемелік, аспаптық және кейбір өзге де құралдардың бір жүйеге біріктірілуі талап етіледі, соның шеңберінде менеджер мен жоба тобының міндеттері барынша тиімділікпен шешілуі мүмкін. Басқаша айтқанда, жобаларды басқарудың интеграцияланған жүйесін құру және пайдалану

шарттарымен қамтамасыз ету талап етіледі. Бұл ауқымды жобаларды орындауда немесе жобалық қызметпен тұрақты айналысатын кәсіпорындарда аса маңызды.

Осыған байланысты авторлар жобаларды басқарудың негізгі бағдарламалық өнімдерін зерттеді, жобаларды басқарудың ақпараттық жүйесін енгізу үдерісін зерделеді, жобаларды басқарудың ақпараттық жүйесін енгізуде менеджерлер жиі кездесетін енгізу кезеңдері мен ықтимал мәселелерді сипаттады.

**Түйін сөздер:** қорғаныс саласы, жобаларды басқару, ақпараттық жүйе.

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### **СИСТЕМНЫЕ РЕШЕНИЯ РАЗВИТИЯ ПРОЕКТНОГО УПРАВЛЕНИЯ НА ПРЕДПРИЯТИЯХ ОПК РК**

**Аннотация.** Сегодня проектная деятельность в той или иной форме присутствует практически в любом предприятии. Руководство предприятий осознает сложность задач управления проектами и выделяют его в качестве важной и специфической части своей деятельности. Для достижения краткосрочных и долгосрочных целей компании работают над выполнением множества логических задач. Процесс управления операционной деятельностью является важнейшим компонентом системы управления предприятием. Все большее количество предприятий (если не все) различных сфер деятельности выделяют проектную деятельность в качестве важной и специфической части управления, а сам процесс управления деятельностью современных предприятий все больше базируется на использовании цифровых технологий.

Предприятия ОПК Казахстана характеризуются тем, что выпускают не только специализированную продукцию военного, но и гражданского назначения. В сфере оборонной промышленности Республики Казахстан реализуются различные виды проектов, направленные на проектирование и производство военной техники и продукции двойного назначения, сервисное обслуживание произведенной техники и оборудования. Реализация проектов включает в себя множество неотъемлемых и взаимосвязанных этапов, групп квалифицированных работников, субподрядчиков, управление задачами, техническое обслуживание, планирование, бюджетирование, решение проблем и общая координация усилий по достижению успешного завершения соответствующих результатов в срок, в рамках бюджета и соответствующего качества.

Данная статья посвящена изучению особенностей реализуемых проектов на предприятиях оборонной промышленности Казахстана и выявлению возможностей для внедрения информационных систем управления проектами в данной отрасли экономики.

Современные тенденции развития оборонно-промышленного комплекса (ОПК) определяют необходимость вовлечения потенциала цифровых технологий, однако отсутствие у предприятий ОПК ресурсов и механизмов, связанных с системными решениями, требуют вовлечения в этот процесс существующие и эффективно функционирующие программные продукты.

Информационные системы управления проектами представляют собой комплексный инструмент, позволяющие обеспечить поддержку жизненного цикла проектов, эффективное планирование и управление ходом работ, соответствие заранее определенным стандартам и требованиям.

Интеграция систем управления проектами на предприятии требует создания определенных условий, позволяющих в полной мере реализовать возможности всей системы управления предприятием. Требуется, чтобы существующие обычно по отдельности методические, инструментальные и некоторые иные средства, необходимые для успешного управления проектом, были объединены в одну систему, в рамках которой задачи менеджера и команды проекта решались бы с наибольшей эффективностью. Другими словами, требуется создание и обеспечение условиями использования интегрированной системы управления проектами. Это особенно важно при выполнении масштабных проектов или на предприятиях, постоянно занимающихся проектной деятельностью.

В этой связи авторами были исследованы основные программные продукты управления проектами, изучен процесс внедрения информационной системы управления проектами, описаны этапы внедрения и возможные проблемы, с которыми чаще всего сталкиваются менеджеры при внедрении информационной системы управления проектами.

**Ключевые слова:** оборонная промышленность, управление проектами, информационная система.

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