

## Principles of Project Management During the Design and Implementation of the Defense Industry Development Programs

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### Abstract

*One of the most important tasks in the field of ensuring the defense and security of the Russian Federation in the modern economic conditions is the transition to a new competitive look of the defense industry complex (DIC). The decisive factor for the stable development of defense industry enterprises is their high-quality innovative and investment activities. The development of project management in the defense industry, which contributes to more efficient development of defense industry enterprises and increases the level of control over their innovative and investment development, can be an efficient tool for its development and improving the efficiency of project implementation, which positively influences the growth of the innovation implementation efficiency.*

*Project management has been successfully applied in the activities of companies for many years. The history of project management is presented, the world and domestic practices of project management are analyzed, conceptual approaches to the implementation of project management principles in the defense industry are proposed, and a change in the corporate governance system when implementing project management is illustrated in the present work.*

*The goals of implementing project management in the defense industry development have been considered, the specifics of project management in the defense sector have been revealed, and the possibilities of using the project approach in the defense industry development have been considered in the discussion. Specific examples of project management in the defense sector have been provided in the present work.*

*Project management is an efficient tool for preparing and implementing innovative and investment activities in the development of the Russian defense industry. The use of project management in the field of defense industry development can significantly save the time and money spent on projects and programs development in the defense industry of Russia.*

**Key-words:** Project Management, Principles, Conceptual Approaches, Innovations, Investments, Enterprises of The Defense Industry Complex.

## 1. Introduction

The national security strategy of the Russian Federation identified one of the most important tasks in the field of ensuring the country's defense and security – the transition to a new competitive look of the DIC (Decree of the President of the Russian Federation, 2009). It is required to arrange efficient activities in the development of the country's high-tech and multidisciplinary defense complex to ensure this, to ensure its ability to meet the needs of the Armed Forces in the modern armaments, as well as to ensure the competitive presence of Russia in the global armaments markets.

The innovative activity of the defense industry enterprises, which is carried out through the implementation of projects, is the decisive factor in achieving this goal. Moreover, the innovative activity of the defense industry enterprises remains low in the modern economic conditions, and the concept of working with "public innovations" is poorly implemented, which involves using external ideas together with own projects, i.e., using both "internal" and "external" methods of creation and commercialization of a new product (Kondybko 2013). These circumstances are the cause of the main problem of the defense industry – the possibility of reducing the technical level and competitiveness of armaments.

The introduction of project management in the DIC of the Russian Federation will contribute to more efficient implementation of the innovation strategy for the development of industrial enterprises of the DIC, increase the level of efficiency in managing the innovation-driven growth of industrial enterprises, and increase the efficiency of innovation.

Project management was applied in practice in full in 1953 – 1954 for the first time, when implementing projects of the US Air Force, and in 1955 in the special projects division of the US Navy in the management of complex large projects (Snegireva 2015).

Du Pont de Nemour developed a theoretical justification for the critical path method (CPM) in 1957. This method was used in the implementation of the Atlas missile program control. Then the PERT network planning system was created, which allowed to create an underwater missile carrier in six years (Anshin, Demkin, Nikonov and Tsarkov 2014).

Methods and tools based on a systems approach and systems theory were actively developed in the 1970s. They include a PATTERN method, which is used to build the structure of goals and tasks required to solve the identified problems. Systematic methods of financial management were developed during this period of time – in particular, the "planning – programming – budgeting"

system, which served as the basis for creating approaches to project and program management (Westland 2013).

The development of project management methods that were customer-oriented began in 1980. The practice of project implementation began to include such tasks as configuration management and quality management, while methods for assessing the risk of project implementation began to develop (Diethelm 2003; Milosevic 2008).

## **2. Methods**

The concept of project management is based on the concept of "project". In this case, the project is regarded not only as a management object that has some properties inherent to it, but also as a general characteristic of the entity that describes the basic property of project management.

The Great Encyclopedic Dictionary defines a "project" as "a unique activity that has a beginning and an end in time, aimed at achieving a predetermined result, creating a specific, unique product or service, with given restrictions on resources and terms, as well as quality requirements and acceptable risk level" (Baguley 2002).

The US Project Management Institute (PMI) standards call a temporary action that is taken to create a unique product (service) (The Standard for Program Management, 2015).

Russian GOST R 54869-2011 "Requirements for project management" describes the project as a complex of interrelated and interdependent activities, which is aimed at creating a unique product (service) in the presence of time and resource limitations.

Project management is based on three project characteristics:

1. having a unique purpose,
2. limited timing of the project in time, and
3. availability of resource limits.

The concept of project management is based on a conceptual view of the project as a change in the state of the system, which will be determined by the cost of time and money. The process of implementing these changes according to pre-developed rules (within the budget and time constraints) will be the project management. This can be added to the provision of an acceptable degree of risk aimed at arranging the achievement of a goal in the form of creating a new product (service).

### 3. Results

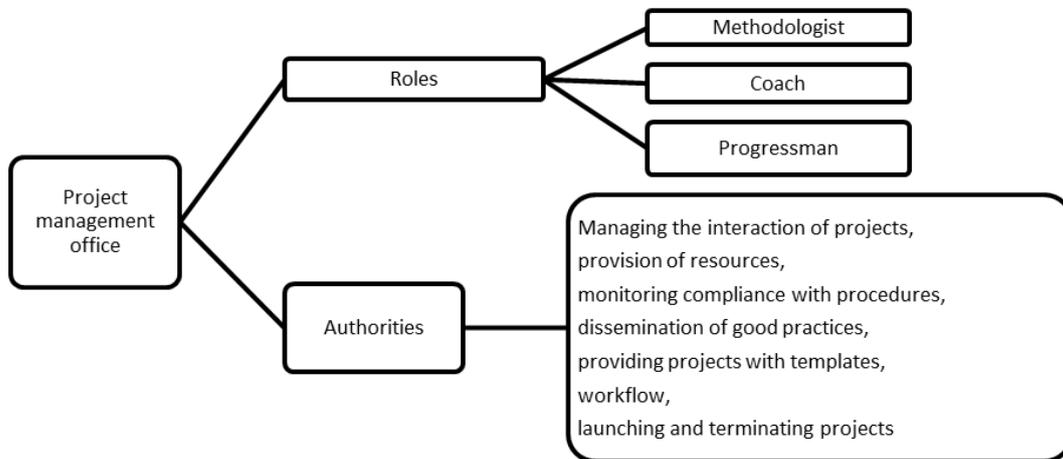
#### 3.1 World practice of project management

Each enterprise focused on project management requires the organization of a special corporate innovation management system. At the same time, project management can be aimed both at creating a new product or new technology, or at changing the organization of work in the company. A project management office (PMO) is created to do this, when starting a new innovation or concept (Anshin, Demkin, Nikonov and Tsarkov 2014).

The concept of "project management office" is defined in the international "Guide to the Project Management Body of Knowledge" (PMBOK, 5th edition) and is considered as a kind of temporary organizational structure able to solve the problems of structuring and streamlining all processes related to the implementation of innovations, as well as to exchange methods, tools and resources (A Guide to the Project Management Body of Knowledge, 1996, 2014, 2014, 2015 ).

The best world practices for creating a project office are presented in Figure 1.

Figure 1 - The best global project management practices when creating a PMO



#### 3.2 Project management practices in Russia

There are the following national project management standards in Russia at the moment:

The Russian Project Management Association (SOVNET) based on the IPMA standard developed the "Fundamentals of Professional Knowledge. National competency requirements for specialists" in 2001 for the first time. The translation of the ISO 10006:2003 standard is registered, this standard is used as the basis for corporate standards in Russia (Anshin, Demkin, Nikonov, Tsarkov, 2014).

The first national project management standards were introduced in Russia on September 1, 2012:

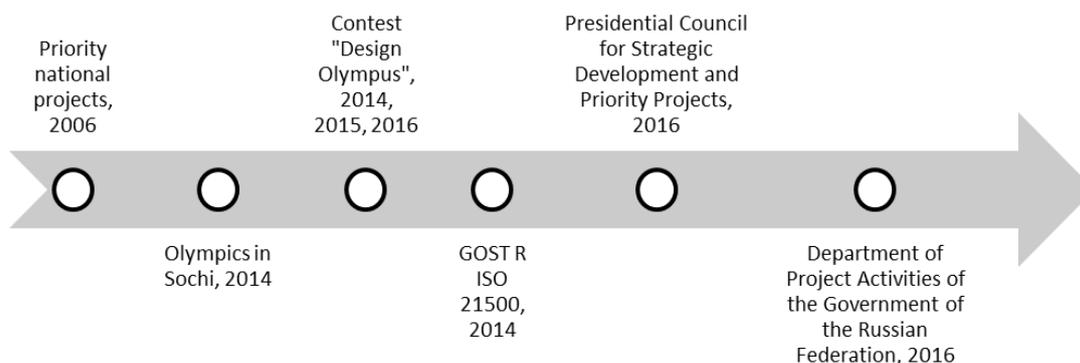
- "Project management. Project management requirements";
- "Project management. Project portfolio management requirements"; and
- "Project management. Program management requirements".

The national standard of the Russian Federation GOST R ISO 21 500 – 2014 "Guidance on project management " is also approved for voluntary use in Russia – it is identical to the international standard ISO 21 500:2012 "Guidance on project management".

The initial ISO 21 500 standard was developed by an international working group, which included experts from 33 countries, including Russia, as well as professional project management associations IPMA and PMI, and entered into force on March 1, 2015.

Milestones in the project management development in the Russian authorities are presented in Figure 2.

Figure 2 - Stages of project management development in the Russian authorities



Project-oriented management structures are created to combine efforts of a team of designers, engineers, suppliers, and consumers. In this case, the stages of the investment cycle are implemented along with the preparation of consumers (Lapygin , 2009).

The project management system was formed at the Ministry of Industry and Trade of Russia. The Ministry of Industry and Trade of Russia ranked first among the federal executive bodies in

organizing project management. Besprozvannykh A.S. is responsible for the organization of project activities. A PMO – the Center for Project Management in Industry ("RTA") – was created at the Department of Regional Industrial Policy and Project Management. The following regulatory documents on the organization of project activities were issued:

Order No. 4675 dated December 26, 2017 "On determining the person responsible for organizing project activities in the Ministry of Industry and Trade of Russia";

Order No. 3848 dated October 28, 2016 "On the establishment of a departmental project management office";

Order No. 3867 dated October 31, 2016 "On approval of the plan for the implementation of priority measures for the organization of project activities";

Order No. 4139 dated November 23, 2016, order No. 1081 dated April 7, 2017 "On approval of the Regulation on the organization of project activities in the Ministry of Industry and Trade of Russia";

Order No. 702 dated March 14, 2017 "On approval of the Regulation on the departmental project management office"; and

Order No. 807 dated March 21, 2017 "On the formation of a coordinating body for project activities" (Gordon 2006).

The conducted analysis of the formation and development of the project management method in Russia and abroad allows to draw the following conclusions.

The emergence of project management as an independent field of knowledge was a result of the realization of the need to use new forms of management in solving complex technical problems in large-scale projects (primarily in the DIC). In a broader sense, it must be noted that the characteristics of a developing society in the second half of the twentieth century (exponential growth of accumulated knowledge, increasing need for complex products, and development of global competitive markets) determined the development and application of new project management methods.

The project management methods were formed on the basis of the general scientific paradigm that prevailed in the early to mid-twentieth century, which determined the rationalistic and mechanistic nature of the scientific management of this era. A fundamental change in the scientific paradigm of the modern society from rational mechanical principles of Newtonian physics to

quantum mechanics, chaos theory, and synergetics determines the need for further research to form the modern conceptual approaches to project management.

### 3.3 Conceptual approaches to the implementation of project management principles in the defense industry

The problems of the economic activity of defense industry enterprises in the modern conditions require the development of a project management system, where innovative, investment, organizational, motivational, and informational projects form innovations and thereby contribute to the revitalization of the result-oriented enterprise (Filimonova 2010).

The introduction of project management in production will allow the defense industry enterprises to accelerate the development and production of promising armaments and military hardware for the Armed Forces of the Russian Federation, as well as provide an opportunity to enter the global arms market (Malikova , 2017).

The concept of project management at defense industry enterprises should be aimed at creating methods that include analytical processing of scheduled operations, organizational modeling, control and regulation of the development, and pilot production of new models of military equipment.

The operational activities of the enterprise are carried out in accordance with the strategy of the enterprise, which allows to manage projects in accordance with the project management methods and to obtain high results of the enterprise activity. At the same time, project management acts as an efficient mechanism that affects the managed system and ensures the achievement of the goal in a given time frame and with limited resources (Kondybko 2013).

Project management in the pilot production of defense industry organizations must comply with the basic principles presented in Figure 3 (Malikova 2017).

Figure 3 - Basic principles of implementing project management at the defense industry enterprises.

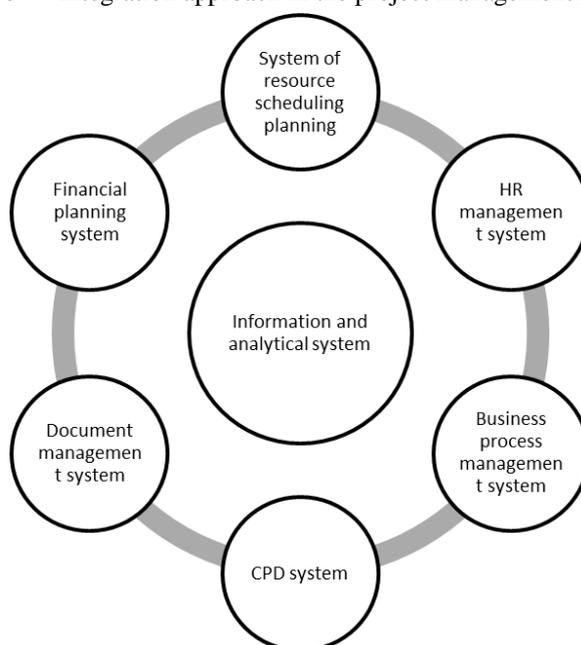
Principle of targeting	Principle of consistency	Principle of universality	Principle of integrity
<ul style="list-style-type: none"> <li>•need for targeted orientation of projects on achieving final results</li> <li>•basis of goal setting and risk reduction – technological forecasting</li> </ul>	<ul style="list-style-type: none"> <li>•complex approach</li> <li>•application of the project approach at all stages of the life cycle</li> <li>•control of factors influencing the implementation of projects</li> <li>•coordination of activities</li> </ul>	<ul style="list-style-type: none"> <li>•possibility of applying to solve problems of any complexity</li> <li>•possibility of application in production systems of any level and industry</li> </ul>	<ul style="list-style-type: none"> <li>• use of systems of predefined characteristics and indicators used to assess the project performance</li> </ul>

The principle of project management integrity provides for the use of a system of predefined indicators in the development of projects that are formed during the monitoring of project activities and form the basis for evaluating the performance and efficiency of projects.

The use of various design methods at various stages of the life cycle of high-tech projects significantly increases the efficiency of project implementation.

The principle of integrity provides for the inclusion of other production management systems in the project management system, as well as for optimization of resources. Moreover, the accumulated experience, as well as previously used design models, can be actively used in other projects (Snegireva 2015) (Figure 4).

Figure 4 - Integration approach in the project management system



The system of advancing individual and collective training of managers and participants of project groups is required, which should be aimed at developing professional knowledge and skills, as well as formation of broader competencies, which are based on knowledge management, ability to work in a team, ability to make decisions in conditions of information uncertainty, focus on achieving results, leadership, strategic thinking, etc. This will ensure the efficient introduction and the use of flexible and extreme methods of managing various types of complex projects.

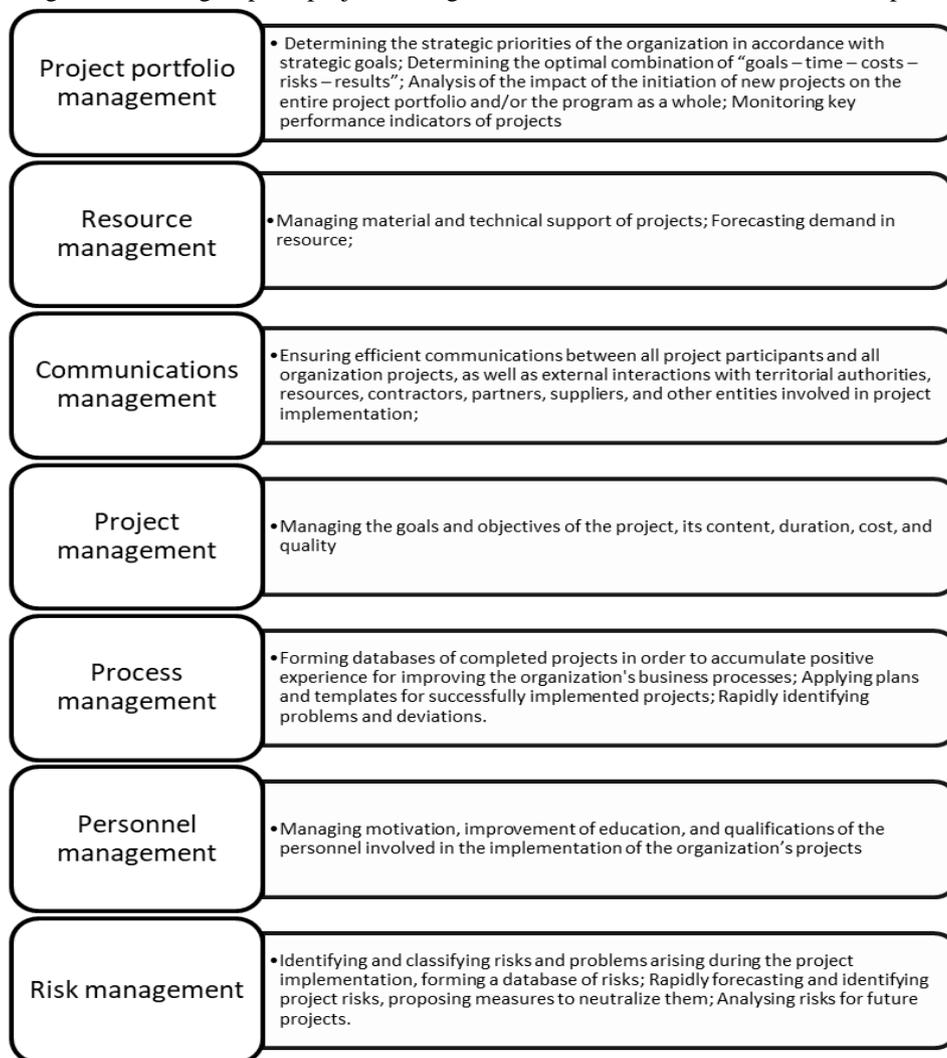
The conformity of project management to the above principles will ensure management sustainability, adaptability, as well as the possibility of improvement and development. This factor is the main characteristic of innovative management, and also contributes to the achievement of a

synergistic effect in the process of implementing the goals of the project activities of defense industry enterprises for the production of defense products, which are highly competitive in the global arms market.

Project management combines the principles of managing projects with business practice and becomes the basis for the implementation of the existing enterprise development strategy. The implementation of the project management concept involves all participants in managerial decision-making in the project implementation. At the same time, the concept of project management should be considered as a higher document than managing projects. At the same time, managing projects should be in the focus of the concept of project management to allow an industrial enterprise to optimize its operation on the strategy implementation (Shevchenko 2009).

The key functions of project management are presented in Figure 5.

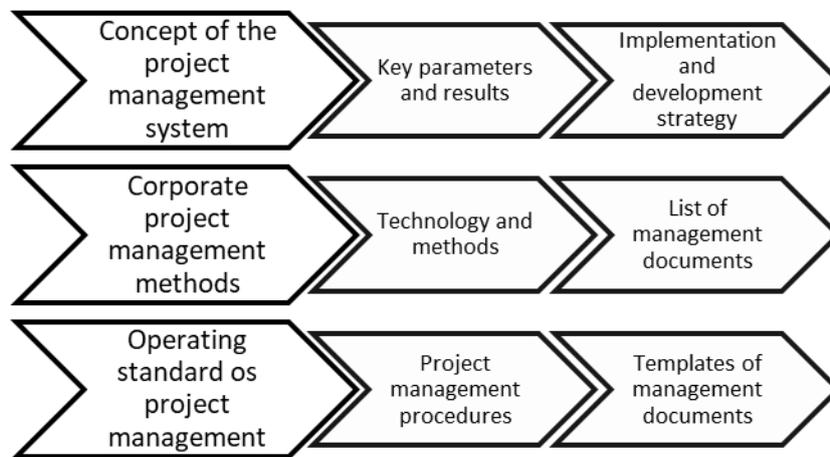
Figure 5 - Main groups of project management functions and their content description



The whole set of project management methods must be used when implementing project management for a specific project. No universal project management methods for all projects and industrial enterprises exist (Bridges 1997).

The project management procedure for each industrial enterprise is developed with due consideration for the accumulated experience, best practices and recommendations proposed by the standards of research organizations. A set of developments by the Project Management Institute is an example of such recommendations. It contains the following main stages of project management implementation at an industrial enterprise (Figure 6) (Cleland and Gareis, 2015).

Figure 6 - Main stages of implementation and implementation of project management standards at the enterprise



The following advantages are achieved when using project management at the defense industry enterprises:

- reducing the total demand in resources, as well as reducing the project cost, which leads to economic benefits;
- getting the opportunity to quickly analyze the impact of changes in the schedule, resources, and financing on the results of the project, to analyze the efficiency of investments, as well as the ability to unify the stages of project management;
- using mathematical methods for calculating the characteristics of projects will improve the efficiency of their management;
- reducing the number of failures in the work on the project;
- ensuring centralized storage of information on the work schedule, use of resources, and expenditure of funds; and

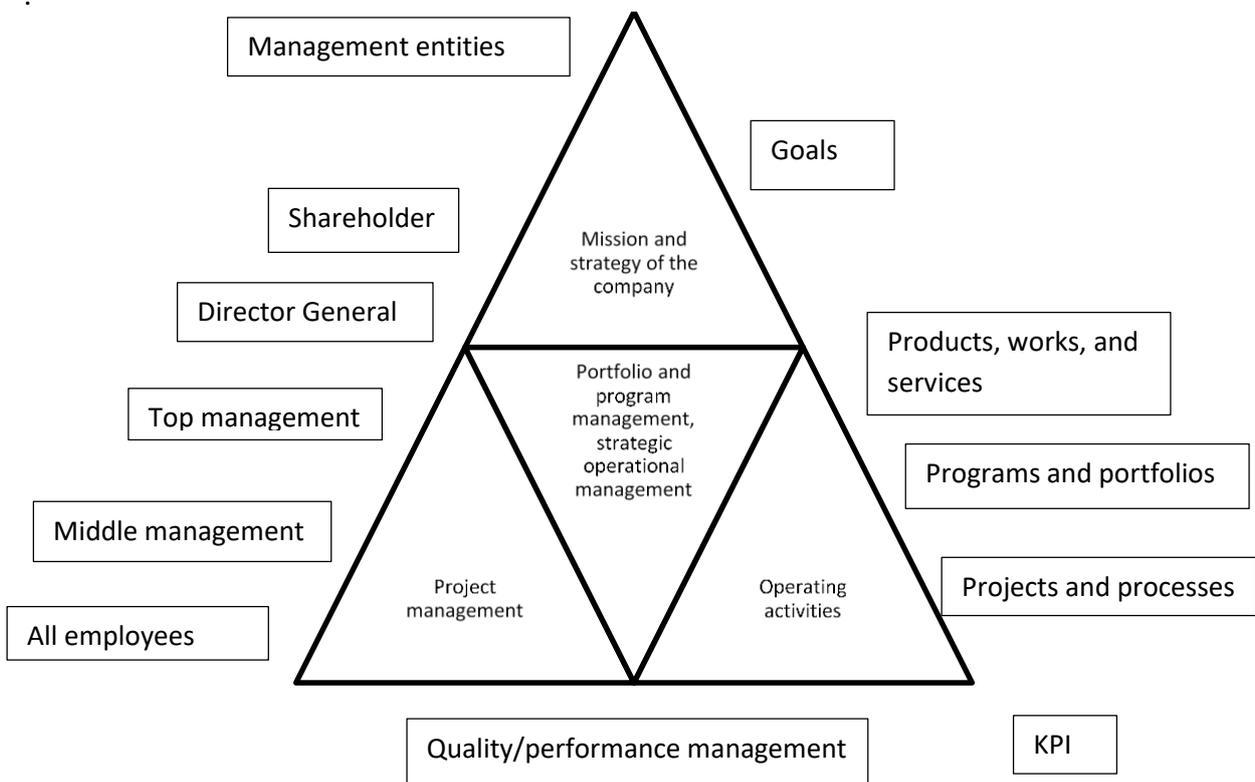
– ensuring accounting and managing risks of projects, controlling quality of works performed, supply and contract management while ensuring project activities.

The methods of project management of the production of new armaments samples form and maintain the focus of management activities and have positive impact on increasing the speed of development, and also improve the quality of the product (service) at the defense industry enterprises.

### 3.4 Changes in the implementation of the corporate management system

Changes that will occur in the enterprise during the implementation of the corporate project management system are presented in Figure 7.

Figure 7 - Changes in enterprise management during the implementation of project management



When implementing project management at the level of enterprise management, an understanding of the proper model of the corporate project management system will be formed, which will allow to build a proper system of strategic goals and operational tasks during the transition

to the corporate project management system and to provide the necessary tools to control the success of innovations in the implementation of defense, dual-use and civilian projects (Organizational Project Management Maturity Model, 2015).

At the level of project managers and project teams, it will be possible to integrate the current and planned project work into a single corporate project management system, to move to the efficient implementation of the tasks set by management in a single conceptual field, as well as to develop documents that are optimal in content when preparing contracts and negotiations with investors.

At the level of nonproject specialists, executiveness will improve in terms of deadlines, quality, and optimal cost of resources due to the clear coordination of work parameters with project managers at the planning and distribution stages of such works.

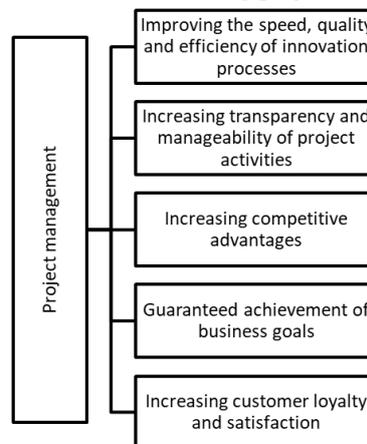
The implementation of the following projects of defense industry enterprises can be improved: R&D, implementation of new technologies and re-equipment of production, diversification of production and access to new markets, development of new products, and execution of public defense contracts.

## 4. DISCUSSION

### 4.1 Goals of introducing project management in the development of the defense industry

The goals of introducing project management of the implementation of state programs of the Russian Federation in the defense industry development are presented in Figure 8.

Figure 8 - Goals of introducing project management



The primary tasks of the project management of production at defense enterprises are the following:

- accelerating the development and production of promising highly competitive defense industry products to increase the level of equipment of the Russian Armed Forces with new armaments;
- implementing state and federal targeted programs in the field of development of the DIC in full and in accordance with the budget;
- creating an efficient system of cooperation between enterprises and scientific organizations in order to integrate technical and technological innovations in the production of highly competitive defense industry products;
- modernizing the production of defense enterprises, introducing promising equipment and technologies that would be aimed at improving the technical equipment and updating the armaments in service;
- fulfilling plans for the replacement of imported products in terms of components, raw materials, and materials in the performance of the state defense order;
- introducing technological audit and expansion of the range of production of specialized high-tech civilian products; and
- using principles of public-private partnership in the defense industry.

Defense industry enterprises must master the modern management technologies and learn to speak the same language of project management with investors and other contractors from various industries and countries to solve problems in this area.

## **4.2 Specifics of project management in the DIC**

There is an integration of enterprises by product and technological principles in the DIC today. Competence Centers are formed for the tasks to be solved during integration. The Competence Center, which serves projects and initiatives, is associated with knowledge management, conducts staff training on new products and services, assesses the technologies used, etc.

The specifics of project management for defense industry enterprises are associated with the following:

- 1) strong aggressive opponents among stakeholders;

- 2) zero sum strategy games;
- 3) decreasing resource base;
- 4) loss of engineering competencies;
- 5) limited market mechanisms;
- 6) technology lag;
- 7) information system lag;
- 8) personnel gap;
- 9) methodological collapse; and
- 10) other specifics.

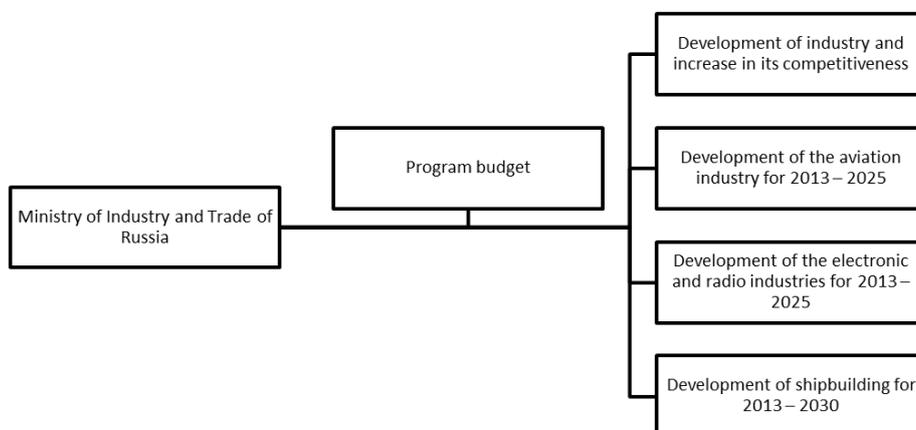
Project management allows to address these problems due to the high efficiency of management in terms of productivity, reducing time and costs by type of works and the project as a whole.

#### 4.3 Possibility of using the project approach in the DIC development

The current stage of project management development is described by the expansion of their scope and integration with other industrial enterprise management tools.

The list of the current state programs of the Russian Federation was approved by Order of the Government of the Russian Federation No. 1950-r dated November 11, 2010. State programs of the Ministry of Industry and Trade of the Russian Federation in the field of DIC development are presented in Figure 9.

Figure 9 - State programs of the Ministry of Industry and Trade of Russia in the field of the DIC development



State policy in the field of the DIC development is aimed at transforming the defense industry potential into an innovative resource that will provide the state with armaments and also help to solve priority problems in the areas of transportation, communications, fuel and energy complex, healthcare, and manufacturing (Rossi, Lipsey and Freeman 2004).

Project management methods are not widely used in the DIC today. However, there are some successful examples of the implementation of project management both in private companies and in enterprises with a significant share of state ownership in Russia. The most appropriate application of the project approach is in high-tech and science-intensive industries, such as oil and gas industry, construction, financial organizations, as well as in projects associated with the use of digital technologies and in socioeconomic projects.

First of all, project management needs to be implemented in pilot projects associated with the creation of armaments, restructuring industrial production, etc. This will require a lot of organizational effort, as well as financial costs, which are repeatedly paid back with project management. This will ensure significant budgetary savings in the production of armaments (Shadish, Cook and Leviton 1995).

Project management fundamentally changes the production scheme, as well as its organization, which contributes to the growth of production efficiency and increases the competitiveness of the enterprise in the world markets for competitive armaments.

Research and development costs are reduced (by 64 % in research and development in the field of civil aviation and by 36 % in the field of military, space, and aviation systems). For example, the Boeing aerospace company reduced the production time of a light helicopter from two years to ten months when implementing project management, and the German company Fokker halved the design time of the Fokker-70 system. The Airbus Industry consortium reduced the production time of a light jet from 12 to nine months (Spacey 2013).

## **5. Conclusion**

Using the modern approach and project management tools allows to save up to 20 – 30 % of the time and about 15 – 20 % of the funds spent on projects. This allows to assert that project management is an efficient mechanism for preparing and implementing innovative and investment activities in the field of the DIC development.

Project management at the defense industry enterprises will contribute to more efficient R&D, the introduction of new technologies and the re-equipment of production, solving problems of diversifying production and entering new markets, as well as the successful development of new products and the implementation of the state defense orders.

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