

Risk and Countermeasure of Military Equipment Development Project Management

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Abstract. In view of the complexity of military equipment development project management, and combined with the summary and analysis of many cases, this paper mainly discusses the potential risks of time, cost and quality in the scientific research, production and operation activities of military enterprises, and puts forward some suggestions to make risk management scientific in order to improve the quality of military equipment development of project equipment.

1. Introduction

Over the years since the founding of New China, the management of military projects has been followed by a highly centralized and functional organizational structure. This model has played a huge role in certain historical periods, but its drawbacks have also been exposed with the establishment and perfection of our socialist market economy. With the changes in the market investment environment, the reform of national policies, and the acceleration of the upgrading of national defense technology, the development of military equipment is facing increasing demands for military struggle preparation and market competition. The military industry urgently needs to use scientific and reasonable project management methods to reduce the probability of risk occurrence. Promoting the refined management of military equipment development projects to enhance its core competitiveness, and make due contributions to national defense science and technology.

2. Significance of Risk Management in Military Equipment Development Project

Military equipment development projects generally have characteristics of interdisciplinary and multi-professional crossover and integration, long-term research cycle (around 5-20 years), huge funds (from tens of millions to billions), tight schedule, and strong comprehensiveness and so on, which lead to the inevitable characteristics of risk. The uncertainty of risk occurrence and the huge loss that may result determine the importance of project risk management. In the process of project development, there will be many risks such as technical risks, security risks, schedule risks, cost risks, and quality risks. If you can't control these risks, it may lead to a series of negative results such as project delays, cost increases, indicators reduction, and even the project will die halfway. Therefore, aiming at the characteristics of military equipment development projects and the characteristics of risk diversification, a risk evaluation mechanism has been established, which not only helps to strengthen the risk management level of the project, but also facilitates the smooth progress of the project. In addition, through the analysis of risk management of military equipment development projects, it can accumulate rich data and experience of project risk management, paving the way for expanding project risk management to other military projects.

3. Risk Problems and Analysis of Military Equipment Development Projects

3.1. Current Situation and Risk Analysis of Project Time Management. For the sake of national security, it is particularly important to control the progress of military equipment development projects. Once the project is delayed, it may cause a series of risk problems: the sharp increase of project cost, the impact of the time schedule of a parallel project or the next project, the quality of military equipment delivered cannot be obtained, and even the national security can be affected.

The long cycle of the project and the urgent need for national security have made the project time management more difficult. Because of the huge investment, complex technology, interdisciplinary and multi-professional crossover and integration, strong comprehensiveness and wide collaboration, the period of a military equipment development project from project establishment to design finalization often lasts for decades. However, due to the political tasks required by national security, military equipment may be in urgent need of testing, arranging mass production and putting into use, resulting in the cycle of military equipment research and development projects has been repeatedly shortened.

The scarcity of human resources makes project time management more difficult. On the one hand, in the research and development of military equipment, multi-project parallel advancement is normal, but not every technician has the ability to complete the research and development tasks at the prescribed time nodes. Therefore, technicians with outstanding abilities tend to undertake many research and development tasks at the same time. In addition, military equipment development projects are often too complex, difficult and time-critical, but people's energy is limited. Therefore, multi-task will reduce work efficiency, affect the work effect, and lead to the time schedule of military equipment development projects cannot be carried out on schedule. On the other hand, in the production stage of military equipment, because of the particularity of military equipment projects, factories need to possess specific production qualifications to produce military products, and the entry threshold is higher. Therefore, in the case of a certain total production, there are not many factories qualified to produce military products, which leads to heavy production tasks of workers, delays in production arrangements of military products, and ultimately leads to a significant increase in time risk of military equipment development projects.

The continuous change of customer demand makes project time management more difficult. Due to the special needs of national security, the production of military equipment products has the typical characteristics of multi-varieties, small batches, single-piece, and build-to-order. At the same time, the emergence of emergency orders and the subsequent insertion production are also very frequent. In addition, the change of task nodes of higher authorities and the uncertainty of technical status easily lead to the confusion of production rhythm. All of the above uncertainty factors determine that the production of military equipment cannot form a stable production plan and production process, which is easy to lead to the instability of the project schedule or even make it out of control, resulting in a substantial increase in project time risk.

3.2. Current Situation and Risk Analysis of Project Cost Management. With the advent of the era of information warfare, the requirement of all-round and comprehensive offensive and defensive combat capability in modern warfare is constantly improving, which makes the cost of military equipment and the project risk increasing day by day. In order to ensure the safety, reliability and supportability of military equipment, it is necessary to consider the cost risk of each link in the whole process of military equipment development, so as to reduce the potential risk.

The complexity of the development technology makes the project cost management more difficult. In military equipment development projects, new research equipment has to go through military engineering research, model development and other stages. Higher requirements for process technology research and product production procedures lead to the complexity of development technology. First of all, military equipment development projects are very professional and need to cover a wide range of areas, meanwhile, the project development personnel are required to cover up to dozens of areas of specialty. Secondly, the functional performance requirements and general

quality characteristics of military equipment products are very comprehensive, and their reliability, maintainability, supportability, testability, safety and environmental adaptability should be guaranteed at the same time, and the requirements of generalization, combination and standardization should also be met.

The uncontrollability of project cost makes the project cost management more difficult. Firstly, Because of the uncertainty of technology, the probability of a sharp rise in human costs and travel costs increases dramatically, resulting in overexpenditure of costs. Secondly, because military products are new products, it is difficult to make an accurate evaluation of the rationality of the design drawings and reports in the process of development. At the same time, the design review process cannot get enough attention, which makes project cost management more difficult. In addition, due to the particularity of military equipment, there are often repeated tests to ensure the reliability and safety of military equipment, which leads to the uncontrollable investment cost.

Imperfect management system makes project cost management more difficult. Due to the long-term emphasis on technology and management in the development of military equipment, there is a lack of horizontal project management system to coordinate work among various functional departments. Therefore, in the case of multiple military equipment development projects concurrently, if there is no reasonable project management system to balance and coordinate among departments and project groups, it is easy to cause conflicts, reuse and waste of human and material resources, resulting in cost out of control, and management is difficult to carry out.

3.3. Current Situation and Risk Analysis of Project Quality Management. For the need of national security, military equipment has to be manufactured according to the quality standard of GJB9001C. Whether the quality of military equipment meets the standard or not will be strictly tested in actual combat drills. As is known to all, the quality of military equipment development projects should be paid enough attention, because it is not only related to the competitiveness of a country, but also to the safety of people's lives and property.

The high quality requirement of products makes project quality management more difficult. Because military equipment is different from ordinary products, it is used to protect people's lives and property, and it is also a symbol of national strength. In addition, with the rapid development of modern science and technology, the performance requirements of military equipment are getting higher and higher, resulting in more and more complex production process, which greatly increases the probability of quality risk. In the face of such high quality requirements, the development of military equipment may lead to a significant increase in the difficulty of project quality management due to the lack of technical standards, shortage of funds or limited time.

The lack of quality awareness of production personnel makes the project quality management more difficult. Because of the particularity of military equipment projects, the entry threshold for qualified factories producing military equipment is higher. Therefore, qualified factories often have heavy production tasks. In addition, the urgent need for national security also tends to result in a tight production cycle. In this case, if the quality consciousness of the producers is not strong, it will probably result in the production of the products paying too much attention to the progress and quantity to meet the standards, but neglecting the quality of products, failing to organize production strictly in accordance with the requirements of the production process of military equipment. In addition, due to the confidentiality of military equipment, most managers may not have the authority and platform to monitor the production process in real time, resulting in the production of products cannot be effectively monitored, and quality management is difficult to promote.

The adjustment of the technological process makes the project quality management more difficult. Due to the need of national security and practical drilling, as well as the improvement of production technology, the process of each batch of military equipment work pieces will be adjusted in the actual production process. This will result in subtle differences in each batch of work pieces, and inconvenience in the practical application process, leading to a great increase in the difficulty of product quality management of military equipment.

4. Solutions

4.1. Improving the Level of Project Time Management by Using Work Breakdown Structure (WBS). Firstly, on the basis of work breakdown structure (WBS), the military equipment development project is decomposed into multiple task packages, which are responsible for the corresponding personnel. At the same time, the development plan of military equipment should be formulated on the basis of fully considering the task and time arrangement of key technical personnel.

Secondly, project managers can use Gantt charts to monitor the progress of tasks and the utilization rate of human and material resources intuitively, and can also track, monitor and systematically evaluate the output of WBS. In addition, the project manager also needs to supervise the production process of military equipment in an all-round way, not only tracking the situation of raw materials, semi-finished products, finished products, production personnel, machinery equipment and production lines to ensure that production can proceed smoothly according to the original plan, but also improving the management information system to achieve real-time cross-departmental sharing of production data information. In case of emergencies, relevant departments can be informed and take measures at the first time, so as to mobilize all departments of the enterprise to supervise the production process, ensure the stability of the production rhythm, and minimize the risk of project delay.

Finally, the product measurement, relevant data and evaluation summary of the project can be carried out simultaneously with the project progress, which can shorten the cycle of the whole military equipment development project, summarize the experience and lessons, improve the anti-risk ability, and improve the time management level of the next project.

4.2. Improving the Level of Project Cost Management by Improving the Management System.

On the one hand, in order to control the cost reasonably, it is necessary to control the cost risk in every cycle of the project. Firstly, in the initial stage of the project, reasonable and comprehensive market analysis, feasibility study and engineering design should be carried out as soon as possible to control the management costs and reduce investment risk from the macro level. Secondly, the expenditure of scheme design, test verification, prototype manufacturing and stereotyping review should be forecasted and analyzed in advance, and a reasonable budget should be given to prevent cost runaway. In addition, in the process of equipment decommissioning disposal, the cost of follow-up maintenance, technology improvement, disposal of all kinds of irreparable parts and material recovery should be included in the project cost risk management, so as to strengthen the project cost management.

On the other hand, it is necessary to improve the reasonable management system, which not only fully stimulates the enthusiasm of each project group, but also makes the whole enterprise form a joint force. Therefore, we should not only establish a vertical project management system within each project group, but also establish a horizontal project management system between project groups, so that human resources and material resources can be fully utilized to avoid conflicts and waste. Thus we can control project costs and improve project cost management capabilities.

4.3. Improving the Level of Project Quality Management by Using Appropriate Tools and Methods.

Firstly, according to the specific requirements of the military equipment development project, the project operation instructions and the process documents of military equipment should be compiled in accordance with the actual situation of the project. In addition, special personnel should be organized to evaluate military equipment development projects, especially the site capacity, production equipment, production process and production level of the factory should be paid more attention to.

Secondly, to cultivate the quality awareness of employees, the production process should be carried out strictly in accordance with the requirements of operation instructions and product process documents, and the military equipment must also meet the quality standards of GJB9001C.

Thirdly, raw materials, workpieces and the first military equipment produced must be accepted and qualified before mass production can be carried out. Besides, we should strengthen the supervision of

production process, establish and improve the management information system, so as to realize real-time cross-departmental sharing of production data information, and timely stop and rectify work that cannot meet the process requirements. We should establish a practical system for assessing the quality of military equipment and strictly follow it as well.

Fourthly, by using advanced tools and methods, we can improve the quality management level of the project and reduce the quality risk of the project. For example, WBS is used to define the scope of the project, and RAM matrix is established accordingly; brainstorming method is used to identify and analyze the items of the project, so as to improve the ability of controlling the risk of the project; and software such as Project or P6 is used to improve the ability of compiling, tracking and adjusting the development plan of military equipment.

5. Summary

With the continuous development and progress of national defense science and technology, China is still in the period of rapid development of military equipment development. Military equipment development projects are facing more and more pressure and greater risks. Therefore, in order to fundamentally improve the ability of military equipment development projects to resist risks, it is necessary to carry out multi-dimensional risk identification, full risk assessment and perfect risk control. Accordingly, we can effectively prevent and control all kinds of risks faced by military equipment development projects, minimize the possible losses caused by risks, increase the benefits of military equipment development projects, and improve the quality of military equipment development. Thus, we can promote the scientific development of national defense science and technology industry, especially military equipment industry.

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