

Research on Multi-project Efficient Management System in Scientific Research Institutions

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Abstract

With the vigorous development of China's science and technology industry, the number of projects carried out simultaneously by research institutes is increasing day by day. How to manage and operate multiple projects in parallel efficiently, in a standardized and modular way under limited resource conditions has become an important issue that cannot be ignored in the management process of research institutes. By strengthening personnel awareness building, applying the systems thinking mode, modularly cutting the project management process from the top-level planning, precisely dividing and allocating the functions and responsibilities of each management department, an efficient management system can be established. This will enhance the sensitivity of each management department to the project development progress and strengthen their sense of responsibility for controlling the project development progress. Promote the orderly and efficient operation of the project during the research and development process, thereby achieving the long-term goal of maximizing resource utilization and the sustainable development of research institutes.

Keywords

sustainable development, efficiency, management system

1. Introduction

The 14th Five-Year Plan clearly sets out the goal of accelerating the formation of a new development pattern with domestic circulation as the mainstay and domestic and international circulations reinforcing each other(Wang et al., 2021). How to utilize existing resources, optimize management processes, reduce costs and increase efficiency to promote the development of research institutes is an important way to achieve this goal. The traditional single-project and single-thread management model has led to barriers and a sense of disconnection among various projects, making it increasingly difficult to meet the demands of the transformation and development of research institutes(Li and Wang, 2018). How to build an efficient management model to promote knowledge sharing and collaboration among different project teams, improve the efficiency of operating various projects simultaneously, and be able to quickly identify, assess and respond to project risks, reducing the probability of the same or similar potential risks occurring in other projects, is an important aspect that research institutes need to consider in the project management process.

2. Establish an innovative model for efficient parallel management of multiple projects

2.1 Based on precise division of management activities, clearly define the responsibilities of each management department, optimize management modes, and improve assessment mechanisms

The prerequisite for efficiently managing multiple parallel projects is to break down the same management processes in the management process of multiple projects, establish corresponding management departments, and form a pipeline-style management model. At present, various research institutes have basically formed a relatively mature assembly-line management model. However, due to the unclear responsibilities and task profiles of the connection links among different management departments, the efficiency of parallel management of multiple projects is not high. To enhance the efficiency of multi-project parallel management, it is necessary to clearly define the responsible entities in each management activity, the management boundaries and responsibilities of each management department in the project's full life cycle management, optimize the existing management model, and establish standard processes applicable to multi-project parallel management.

Research institutes should start from the existing scientific research project management system, weaken the independent management characteristics of each scientific research project from the top-level planning level, and emphasize the connectivity of various projects operating in parallel, especially the integrity and correlation of the same management activities in different projects. Based on the existing management model, the management process throughout the entire project cycle is refined and modularized according to the project type, divided into the research and development stage, technical activities, and review process, and the boundaries and responsibilities of each department for "management input - management content - management output" are determined. For management activities in the management process that require the participation of multiple departments simultaneously, it is necessary to clearly define the corresponding responsible department and the supporting responsible department.

By making refined distinctions in management content, precisely defining the responsibilities of each management department, optimizing the original assembly line management approach (Wu and Li, 2019), enhancing the depth and accuracy of management, improving management efficiency, and optimizing resource allocation. But how to establish a comprehensive and effective assessment mechanism to ensure that each project can proceed smoothly as planned and on schedule is also a key means to promote efficient management.

A comprehensive and sound assessment mechanism should be combined with the standard process of parallel management of multiple projects. Specifically, at the initial stage of project initiation, based on the management activities divided within the project's full life management cycle, assessment indicators within the project should be set for each involved management department and incorporated into the full-process assessment system. Among them, the assessment indicators of each department should include standard assessment indicators and specific assessment indicators. The standard assessment indicators should be the minimum management requirements that each department needs to meet for different projects in the same management activities, that is, the corresponding management activities that need to be completed, such as completing the review in accordance with the established process, etc. Specific assessment indicators refer to the addition of corresponding requirements to the original management activities based on the characteristics of the project (such as faster progress requirements and higher quality requirements for this management activity, etc.). Secondly, a sound assessment mechanism should include a positive feedback mechanism that encourages employees to strive and work hard. For instance, relevant reward measures can be formulated or the way performance is distributed can be changed. Most of the rewards or performance that need to be distributed should be reserved, and the completion of milestones or plans should be the main criterion for their distribution. This can directly stimulate employees' fighting spirit.

2.2 Strengthen cultural development and cultivate multi-dimensional parallel management thinking among administrators through diversified approaches

Multi-dimensional parallel management thinking is the prerequisite for the construction of a multi-project parallel efficient management innovation system (Chen and Huang, 2019), and the daily construction of corporate culture is the main means to cultivate employees' multi-dimensional parallel management thinking.

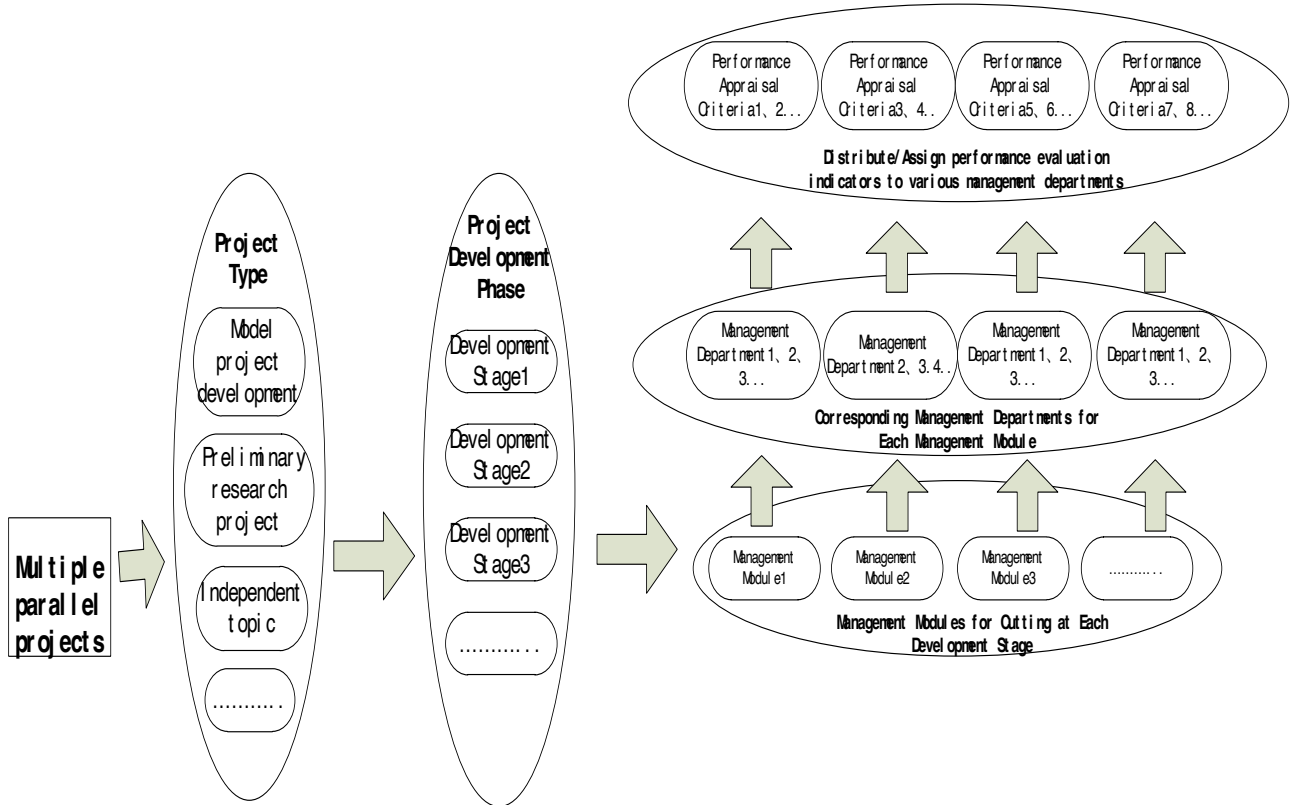
Traditional project management often focuses on the completion status of a single thread, while neglecting the interrelationships and mutual influences among different projects. Therefore, the cultivation of multi-dimensional parallel management thinking should start with the transformation of ideology and way of thinking. Multi-dimensional parallel management thinking requires managers to have a global awareness and systematic thinking (Hambali et al., 2011). It demands that they pay attention to the progress of multiple projects simultaneously during the daily management process, make horizontal comparisons of the same or similar management processes they have carried out in different projects, and improve management level and efficiency. Secondly, in management activities, managers should manage and coordinate limited resources based on the characteristics of different projects. Leaders of various management departments can, in their daily work, promote the multi-project parallel management thinking to managers through means such as emails, wechat, internal work meetings, and learning exchange meetings, enhance the theoretical knowledge of managers, and strengthen the cultivation of management awareness. Finally, each management department can establish an internal job rotation system for its staff, making small-scale transfers to enable managers to master and understand all the management activities in the project's full life cycle management process, expand the management level, deepen the understanding of the connection between various management activities, and cultivate the concept of comprehensive management.

Multi-dimensional parallel management thinking requires breaking down the barriers of conventional management thinking and possessing cross-disciplinary and cross-departmental knowledge and skills to ensure the ability to switch and identify effective management methods within different management activities of various projects, and to clearly carry out cross-disciplinary and cross-departmental collaboration and innovation. Through a combination of multiple learning methods such as cross-departmental joint learning, multi-field integrated learning among various management departments, cross-learning between management and technology, and exchanges with external experts, the learning enthusiasm of management personnel is enhanced, and their cross-disciplinary knowledge and skill reserves, self-management capabilities, and learning abilities are strengthened.

2.3 Establish a comprehensive digital system for multi-project parallel management

Based on all the management activities within the entire life cycle of the project (Chen and Liang, 2000), the advantages and disadvantages of various types of information-based assessment digital platforms currently operating within research institutes are analyzed (Luo and Chen, 2020). It is found that there are inconsistencies and non-uniformity in the current internal assessment digital platforms of departments and research institutes (Zhou and Wang, 2018). The multi-project parallel management digital system is built on the basis of the existing management digital system, connecting and unifying various assessment systems in accordance with the digital system process proposed in Figure 1, to establish a complete multi-project parallel management digital system, achieving overall management and normalized review of the same management activities in multiple projects, and realizing the continuity, traceability and standardization of the entire management cycle. To further enhance the effectiveness of the digital platform, the research team is exploring the implementation of artificial intelligence algorithms. These algorithms could help automate routine assessment tasks and provide more precise data analytics, which will greatly reduce the workload of project managers and improve the overall efficiency of the system (Zhang and Liu, 2017). Additionally, the team is considering integrating a user-friendly dashboard to facilitate easier access and monitoring of project progress for all stakeholders involved. The ultimate goal is to create a seamless, efficient, and transparent management system that benefits both the research teams and the decision-makers.

Figure 1 Digital System Process for Multi-project Parallel Innovation Management



3. Retrospect and prospect

The multi-project efficient management system decomposes the project management process into multiple management activities, processes the same management activities of different projects in parallel, facilitating horizontal coordination and management among various departments. It also enables technical teams to learn from each other, identify and fill in the gaps, and enhance the professionalism and initiative of the teams. In addition, the implementation of a multi-project efficient management and innovation system by research institutes can enhance the market response speed and improve the utilization rate of internal resources. Enhance the team's innovation capacity and optimize product design; Strengthen the project risk control capacity and improve the risk control strategy (Mulva, 2004).

This system further improves the decision-making process by providing real-time data and analytics across projects. With a bird's eye view of all ongoing projects, managers can make informed choices that benefit the overall organizational goals. It also encourages a culture of continuous improvement by regularly reviewing project outcomes and incorporating lessons learned into future initiatives. Moreover, the system fosters collaboration not just within departments but also with external partners, suppliers, and clients, leading to more holistic and effective solutions.

To fully leverage the potential of this system, regular training sessions are conducted to ensure that all team members are well-versed in its functionalities and can utilize it to its fullest extent. This not only standardizes processes across projects but also ensures that best practices are shared and adopted universally. As a result, the organization becomes more resilient and better equipped to handle complex challenges, positioning itself for long-term success in a rapidly changing market landscape.

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Funding

This research received no external funding.

Conflicts of Interest

The authors declare no conflict of interest.

Acknowledgment

This paper is an output of the science project.

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