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Analysis of Full Lifecycle Cost Management of Construction Projects in the Construction Phase

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Abstract: The purpose of this article is to conduct an in-depth analysis of the comprehensive cost management of engineering construction projects during the construction phase, discussing its significance and application in project management. Through an introduction outlining the research background and objectives, the concept, role, as well as relevant theories and methods of comprehensive cost management throughout the project lifecycle are introduced. Subsequently, a detailed presentation of the main aspects of comprehensive cost management during the construction phase is provided, including the budgeting stage, contract stage, implementation stage, and closing stage. This is followed by an analysis of the key factors that influence comprehensive cost management, covering both internal and external factors. Finally, optimization and improvement strategies are suggested, along with a discussion of future research directions and development trends.

Keywords: Comprehensive Cost Management; Construction Phase; Engineering Construction Project; Budget Management; Contract Management; Cost Control.

1. Introduction

1.1. Research Background and Significance

With the continuous development of the global economy, engineering construction projects play a vital role in various domains. However, due to the complexity and uncertainty inherent in such projects, cost management has perennially stood out as a critical challenge in project management. Particularly in the construction phase, whole process cost management assumes paramount importance as it directly impacts budget control, contract administration, cost accounting, and ultimately, project quality and success. Hence, conducting an in-depth study on whole process cost management during the construction phase not only contributes to enhancing the economic efficiency and management proficiency of engineering projects but also holds significant implications for fostering the sustainable development of the construction industry.

1.2. Research Objectives and Scope

This paper aims to undertake a systematic analysis and exploration of whole process cost management in the construction phase of engineering construction projects, delving into its theoretical foundations, practical applications, and managerial strategies. The specific objectives of this study are to provide theoretical support and practical guidance for whole process cost management in engineering construction projects. Specifically, this research will discuss and analyze aspects such as the definition and concept, key components, influencing factors, optimization strategies, etc., of whole process cost management, supplemented by analyses and validations using real-life case studies.

Through a systematic analysis and study of whole process cost management in the construction phase, this research seeks to furnish theoretical references and practical guidance for whole process cost management in engineering construction projects, thereby facilitating their smooth implementation and management.

2. Overview of the Whole Process Cost Management in the Construction Phase

2.1. Definition and Concept of Whole Process Cost Management

Whole process cost management refers to the process of comprehensively and dynamically managing and controlling the investment cost of engineering construction projects from planning and design to completion and acceptance through scientific and systematic methods. It includes budget preparation, contract management, cost accounting, change management, payment management, settlement accounting, and other links, aiming to achieve reasonable cost control, efficient use of funds, and the realization of overall project objectives [1].

2.2. Importance and Role of Whole Process Cost Management

Whole process cost management plays a crucial role in the smooth implementation and successful operation of engineering construction projects. Firstly, it helps in planning and controlling the project budget in advance, ensuring the rational allocation of project funds. Secondly, whole process cost management can timely identify and respond to potential cost risks and changes in the project, ensuring the economic efficiency and quality safety of the project. Additionally, by tracking and accounting for costs at various stages, whole process cost management can provide reliable data support for project evaluation and improvement in the later stages.

2.3. Introduction to Related Theories and Methods

The related theories and methods of whole process cost management mainly include cost control theory, project management theory, principles of economics, and decision analysis methods. Cost control theory emphasizes controlling project costs through budget preparation, change

management, and cost accounting. Project management theory emphasizes the management and control of the project's entire life cycle. Economic principles provide the economic basis and theoretical support for project cost management. Decision analysis methods provide scientific decision-making basis and method tools for project cost management. The comprehensive application of these theories and methods helps improve the efficiency and level of whole process cost management in the construction phase of engineering construction projects, achieving successful project implementation and goal attainment [2].

2.4. Main Contents of Whole Process Cost Management in the Construction Phase

The following content comprehensively covers the main aspects of cost management throughout the construction phase of engineering projects, aiming to achieve effective cost control and successful project objectives.

2.4.1. Budget Phase

Budget preparation methods and principles: Determine the budget preparation methods for the project, including methods based on historical data, expert evaluation, parameter estimation, etc., and follow the principles of cost refinement, comprehensiveness, and operability.

Budget approval and control: Establish reasonable budget approval procedures and authorities, allocate and control the budget effectively to ensure the rationality and effectiveness of fund utilization.

2.4.2. Contract Phase

Contract management and risk control: Establish a sound contract management system, clarify the responsibilities and rights of all parties, standardize the contract execution process, and effectively control contract risks.

Change management and claims processing: Timely respond to and handle changes in the project, reasonably handle claims issues, and ensure the smooth implementation and cost control of the project.

2.4.3. Implementation Phase

Cost control and supervision: Take effective measures to monitor project costs, including developing cost plans, tracking cost changes, identifying cost deviations, and adjusting measures in a timely manner to achieve cost control objectives.

Quality control and safety management: Establish a sound quality management and safety management system, strengthen engineering quality supervision and safety monitoring, and ensure engineering quality and construction safety.

2.4.4. Closing Phase

Cost accounting and settlement: Account for project costs, compare and analyze with the budget, formulate settlement plans, and complete project settlement work.

Overall evaluation and experience summary: Evaluate the overall implementation of the project, summarize project experience and lessons learned, and provide experience references and improvement directions for future similar projects.

I Analysis of Key Factors Affecting the Whole Process Cost Management during the Construction Phase

3. Analysis of Key Factors Affecting the Whole Process Cost Management during the Construction Phase

3.1. Internal Factors

3.1.1. Project Organization and Personnel Quality

The rationality and stability of project organizational structure are crucial for the implementation of whole process cost management. An efficient project organization ensures clear decision-making authority, smooth information flow, and coordinated work.

The quality and capability of project team members directly impact the effectiveness of whole process cost management. Team members with professional knowledge and rich experience can enhance the execution effectiveness of whole process cost management.

3.1.2. Technological Level and Construction Techniques

Advanced technological levels and construction techniques can improve construction efficiency, reduce costs, and facilitate quality control and safety management.

Reasonably selecting construction techniques and methods suitable for the project, as well as adopting advanced construction technologies, are of significant importance for the outcomes of whole process cost management.

3.2. External Factors

3.2.1. Market Environment and Policy Regulations

Changes in market environment and adjustments in policy regulations directly affect the cost of construction projects. Unstable market conditions and frequent changes in policy regulations may lead to cost fluctuations and increased uncertainty.

Understanding and timely adapting to changes in market environment and policy regulations are key to effectively addressing the impact of external factors on cost management.

3.2.2. Supply Chain Management and Collaboration

The effectiveness of supply chain management and the closeness of collaboration relationships are crucial for the whole process cost management during the construction phase. Stable supply chains and good collaboration relationships help reduce procurement costs and improve resource utilization efficiency.

Establishing long-term stable partnerships and optimizing resource allocation and supply chain processes through supply chain management are among the key factors in enhancing the effectiveness of whole process cost management.

In summary, the key factors affecting whole process cost management during the construction phase include internal factors such as project organization and personnel quality, technological level and construction techniques, and external factors such as market environment and policy regulations, supply chain management, and collaboration relationships. A thorough understanding and effective response to these factors are essential for improving the level of whole process cost management in engineering construction projects [3].

4. Strategies for Optimization and Improvement of Whole Process Cost Management during the Construction Phase

4.1. Application of Technological Means and Tools

Introducing advanced information technology and software tools such as BIM technology and cost management software to achieve intelligent management of project costs.

Promoting intelligent construction technology and equipment to improve construction efficiency, reduce labor costs, and ultimately lower the total project cost.

4.2. Organizational Management and Process Optimization

Establishing an efficient project organizational structure, clarifying departmental responsibilities and authorities, strengthening communication and collaboration to improve project management efficiency.

Optimizing construction processes, simplifying procedures, and shortening project cycles to reduce project costs.

4.3. Experience Sharing and Training Enhancement

Establishing experience summaries and knowledge databases, timely recording and summarizing successful experiences and lessons learned in project management for reference in subsequent projects.

Enhancing employee training and skill improvement to raise the professional level and management capabilities of team members, providing talent support for whole process cost management.

Through the implementation of the above optimization and improvement strategies, the efficiency and quality of whole process cost management in construction phase engineering projects can be enhanced, project costs can be reduced, and better economic and social benefits can be achieved.

5. Conclusion and Outlook

5.1. Summary of Research Results

This paper systematically analyzes and discusses the whole process cost management of construction phase engineering projects. By elaborating on the definition, importance, methods, and practical cases of whole process cost management, the role and significance of whole process cost management in engineering construction projects are thoroughly analyzed.

5.2. Existing Problems and Improvement Suggestions

During the research, it was found that there are some problems in the practical implementation of whole process cost management during the construction phase, such as information asymmetry and inefficient management processes. It is suggested to strengthen project organization and process management while promoting technological means and management methods.

5.3. Future Research Directions and Development Trends

Future research can be carried out from the following aspects: further improving the theoretical system of whole process cost management, exploring more scientific and rational management methods and technological means; deeply exploring practical cases of whole process cost management during the construction phase, summarizing successful experiences and lessons learned; strengthening interdisciplinary research with related fields to expand the application scope and depth of whole process cost management. With the continuous development of information technology and the constant innovation of management concepts, whole process cost management during the construction phase will embrace broader development space and higher application value.

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