

Development and Current Situation Analysis of Life Cycle Cost Management

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Abstract: Optimizing structure, strengthening management, and improving cost management ability are important guarantees for enterprises to win the market. In this case, it is urgent for enterprises to open up a new management model and establish a new management mechanism. At present, in the cost management of construction projects, most enterprises only pay attention to the one-time investment during the construction period and pay less attention to the cost of the whole life cycle of the project. Therefore, changing the concept of construction project cost management, paying attention to the project life cycle cost, and solving the problems existing in enterprise cost management are important requirements for enterprise development. Under the background of increasing emphasis on sustainable development, energy conservation, and environmental protection, and building a harmonious society, the management theory and concept of Life Cycle Cost (LCC) are attracting increasing attention and attention. As a theory of comprehensive cost control, many domestic scholars and construction enterprises are actively studying and trying to apply it.

Keywords: life cycle cost; cost management; cost accounting

1. Introduction

Life Cycle Cost (LCC) has been put forward for more than 100 years. From the 1960s to 1970s, it was the brewing and preliminary exploration stage of life cycle cost, and most of the articles published in this period were a summary of LCC. In the 1960s, the US military initially put forward the concepts of life cycle cost LCC and life cycle economy, mainly to avoid the later operation and maintenance troubles and huge economic losses caused by the "short-term behavior" of construction projects, that is, during the whole life cycle of the project, it is necessary to make their own economic budgets and corresponding economic comparisons, and the contractor should be responsible for the whole life cycle of the project [1]. The United States first applied this theory to the procurement of military equipment, and then quickly extended it to civilian enterprises. Terotechnology was founded in Britain in the 1970s. This discipline is based on the idea of life cycle cost, combining the technical and economic management of

equipment, and pursuing the minimization of life cycle cost of equipment as the purpose of comprehensive management of equipment. After the 1970s, the U.S. government and military departments issued a series of related documents based on life cycle cost, including standards, rules, directives, circulars, and manuals [2]. For example, the U.S. Department of Defense issued the Procurement Guide for Life Cycle Cost Evaluation during this period [3]. At this time, most of the articles published are mainly from various aspects of the LCC method for in-depth thinking and research, including cost decomposition, estimation, modeling, review, and evaluation. In order to show its effect, a number of successful examples of applying this theory have been published [4-9]. In the 1980s, the method of life cycle cost has been recognized internationally, and its methods and related regulations have been further improved, and the scope of research and application has also expanded. This theory has entered various fields such as aviation, aerospace, ships, vehicles and buildings, small household appliances, small machinery, etc. During this period, many kinds of literature have been published. At this time, scholars began to think about the optimization method of the life-cycle cost of construction projects and put forward the idea of life-cycle management based on cost, which comprehensively considered the various costs in the construction period and chose the scheme with the minimum life-cycle cost. Since this period, the LCC method has also been applied to the road traffic industry, and some achievements with stage influence have been produced in the 1990s [10]. At this time, the design theory and principle of the life cycle have been written into the relevant specifications and design manuals of bridge design in the United States and Britain, among which the most representative one is "Life Cycle Cost Analysis in Road Design" promulgated by the Federal Highway Administration in 1998. (Life Cycle Cost Analysis in Pavement Design.)

2. Previous Research

Firstly, the idea of life cycle cost management started in the knowledge research field in the 1980s. During this period, scholars and workers studied a lot of data and materials and made breakthrough discoveries. In John's Life Cycle Cost Evaluation of Construction Project, the relationship among construction cost, operation and maintenance cost, and life cycle cost is found, and the

relationship diagram among them is given. The application fields and research methods of life cycle cost estimation were also proposed by Robert et al. Petts and Brooks jointly published Life Cycle Cost Model and Its Possible Applications. Based on the model of life cycle cost management, this paper explores its application scope. During this period, the Royal Institute of Chartered Surveyors also did a lot of practical work to promote the research and development of life cycle cost management theory. At the same time, in collaboration with the royal institute of British architects (riba), many research papers based on life cycle cost management were published in various professional journals such as surveyors and architects' associations, and then a series of industry monographs and guides were published. For example, "Life Cycle Cost Management: A Practical Example", "Architect's Life Cycle Cost Accounting and Preliminary Design Manual", "Building Life-Cycle Cost Management Guide", etc., have also produced a large number of documents and reports on the life cycle cost management of engineering projects. Second, since the 1990s, the theoretical system of the whole life cycle project cost management has been formed. Its applicability in technology and application has attracted the attention of scholars and experts, and gradually formed the following three research directions: the study of uncertainty factors and risks of life cycle cost, the study of practical application fields, and the study of application software about life cycle cost. Up to now, its research on the integration of environmental impact and life cycle cost has attracted more and more scholars' attention with the increasingly serious environmental problems. Hajj obtained the LCC computer algorithm based on fuzzy set and interval analysis, which can eliminate the uncertain influence of all input data, and gave a concrete calculation example. The research shows that the model and algorithm proposed by the author can overcome the shortcomings of traditional technology. Third, research and application in the practical application field. At present, all construction fields have studied and applied the life cycle engineering cost and management technology, which covers all buildings, highways, bridges, and water conservancy systems including a specific component of the building. For example, Liu and Itoh adopted the optimal maintenance strategy of network-level bridge life cycle management, and calculated the maintenance probability and expected life cycle cost of degraded highway bridges by a modified event tree analysis. More and more attention has been paid to the development of science and technology and environmental issues. Stemer discussed how environmental functions affect the life cycle cost of buildings, established the relationship between life cycle cost and environmental impact caused by energy use in the operation stage, and made sensitivity analysis on similar buildings, and discussed the uncertain impact on life cycle cost caused by the increase of discount rate and energy price. Research shows that although the initial construction cost of traditional buildings is very low, the energy consumption and environmental impact are very

high. By establishing a bid evaluation model that integrates environmental impact and life cycle cost, he helps customers build building systems that save energy, have low life cycle costs, and have little impact on the environment. Up to now, the research and development of life cycle cost management theory in western developed countries are relatively mature.

3. The Current Study

At present, the methods and means of studying the life cycle cost mainly draw on the experience of the United States. This concept was first introduced in the field of equipment management. The Equipment Management Association has set up the LCC Professional Committee, whose main task is to introduce relevant theories and methods and learn from their experience. After continuous study and research, the current researchers tentatively held the first LCC academic conference, which produced gratifying results. During the conference, experts and scholars exchanged and discussed with each other, resulting in many ideological collisions, and only more than 70 papers were published. At the same time, some military and civilian units have obtained application results. At present, when selecting and evaluating military equipment, it is necessary to study the cost of the whole life cycle. Therefore, great achievements have been made in the LCC work of some industries. In various related industries, many units and scholars are making great efforts to expand the applicable scope and usability of the LCC method. Fortunately, researchers have made great progress in equipment selection, project renewal and reconstruction, maintenance cost control, and related management methods and means. In 1994, because the purchase cost and maintenance cost of weapons and equipment were relatively high, the research on how to control and reduce the funds of weapons and equipment attracted the attention of national defense departments. At this time, the researcher cited the life-cycle cost, analyzed the costs relative to weapons and equipment, and analyzed their relationship, and proposed to adopt the concept of life-cycle to face the purchase cost, and formulated an operable monitoring method for weapons and equipment funds. It should be noted that the research focuses on the design decision-making stage in the early stage, and does not highlight the costs in the later maintenance stage, so its theory is imperfect.

4. Conclusion

The method of life cycle cost control and management has also been successfully applied to other practical activities. Through the application of this theory, many enterprises have realized the quick and effective selection and evaluation of their equipment, and at the same time, their economic benefits have been greatly improved. In a word, the whole life cycle cost management system has been mature, and its core idea is to follow the principle of the best sum of construction and operation and maintenance costs in the alternatives in the decision-making stage of project investment, and its practicability has also been generally recognized by

scholars.

Acknowledgment

This work was supported by a grant from Funded by Science and Technology Project of Hebei Education Department (BJ2019073).

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