Engineering Cost Information Management in Big Data Era

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Abstract. With the development of Chinese society, the era of big data and the increasing informatization, information and scientific systems have gradually formed in various fields and enterprises, but the process of improving company management has also received great challenges. Especially in the engineering cost industry, to comply with the requirements of the times, it is necessary to change the previous management method, but the era of big data has also brought new opportunities and opportunities to engineering cost management. The goals of the engineering cost industry, how companies can fully use the advantages of big data in engineering costs, solve related problems, and improve the overall social and economic benefits by means of data and information technology have become in-depth discussion questions. The purpose of this article is to study the problem of information management of engineering cost in the era of big data. By establishing a unified cost data collection standard on the basis of big data, the quality of data collection is improved, which facilitates the classification and processing of subsequent data, increases the source of data collection, and improves the quality of data. Improve the competitiveness of project cost management. Strengthen data mining and analysis, lower the threshold of data management, so that more project cost management staff can master. Based on the analysis of the needs of the platform, the frontline project cost personnel of the construction unit and the engineering cost consulting unit were the main survey objects, and it was found that most people have not worked for five years. And 62% of the engineering cost workers still get the latest project cost information from the project cost information journals and websites responsible for the cost station.

Keywords: Big Data Era, Company Management, Engineering Cost, Construction Unit

1. Introduction
With the continuous development of society, the number of construction projects has increased rapidly and the construction period has been shortened. China's engineering cost management is facing tremendous pressure, which puts forward higher requirements for the original engineering cost management model. At present, China's construction cost information management lags far behind the rapid development of the construction industry. Many deep problems in the construction cost
information management system have severely restricted the development of construction cost management. With the gradual development of engineering cost management in the late 1980s, engineering cost management software has been popularized and applied, and engineering cost information management has begun to form and develop. With the rapid development of society and the popularization of the Internet, the collaborative office model formed in the management of construction project management such as enterprise resource planning, supply chain management, and knowledge management in the information age has also promoted the development trend of project informatization. In recent years, most engineering cost consulting companies have professional computer systems and engineering cost management software. Various engineering cost management agencies have gradually established engineering cost information management platforms, but they are still in the early stages of engineering quantity calculation and engineering evaluation. According to the summary and preliminary statistical analysis of project cost indicators, the project cost industry has not yet established standards, a complete project cost information source sharing platform, and cost consulting companies have not yet established and improved project cost management information and resource databases.

Some enterprises recognize the benefits of big data for project cost management, but blindly adopt new technologies and the existing management mechanism is uncoordinated, and some problems have also appeared in the operation process [1]. The first is the lack of strict standards for informatization. The project involves multiple processes and has a large workload. The resulting amount of data is large. The data collection work is collected by different departments and professional staff. Due to the lack of uniform data collection standards, data analysis and processing in the process of integrating data are subject to certain restrictions [2]. Secondly, the information collection and management technology needs to be improved. Information technology is the key to the informatization of engineering cost management. Some companies have not followed up the information collection and processing technology. The part that differs from the project construction target and the actual situation has not been adjusted in time. The calculated data results are less accurate [3]. Finally, the overall quality of engineering cost personnel is not high, is not adapted to the information-based working environment, and some of them have not received certain skills training, failing to effectively use information technology in their work, affecting job innovation and development.

The content of engineering design contains many influencing factors, such as the professional level of designers, project estimates, and project scale. Different design enterprises need to design corresponding plans according to the type and scale of the project. For large projects, different designers are selected in different regions, which makes it difficult to manage project cost information. Generally, for a set of engineering design schemes, cost managers need to compile new estimates and price limits, but the lack of communication between the two parties limits the effectiveness of engineering design and reduces the operating standards of design schemes. Using big data, for designers and engineering cost personnel, the degree of data sharing between the two parties is strengthened, and the latest material prices are more timely understood, so as to provide better information support for engineering design. Engineering construction involves a large amount of materials, and its construction cycle is relatively long. During the construction period, the actual price of materials fluctuates greatly. In order not to affect the construction cost, big data technology is used to collect information such as materials and equipment usage fees to help the construction unit understand the construction process and various factors that cause cost changes. Improve the accuracy of bid quotes from construction units. Ensure the profitability of the construction of the construction unit, maximize the profit of the project, and ultimately ensure the efficiency and quality of the project construction.

Based on big data, this article establishes a unified cost data collection standard to improve the quality of data collection, facilitate the classification, classification and processing of subsequent data, increase the source of data collection, improve the quality of data, and increase the competitiveness of project cost management. Strengthen data mining and analysis, lower the threshold of data management, so that more project cost management staff can master. Through the platform demand
analysis, the main survey objects are the first-line project cost personnel of the construction unit and the project cost consulting unit.

2. Method

2.1 Establish a Unified Cost Data Collection Standard
The collection and importance of cost management data under big data lies in the establishment of cost information data standards suitable for national or industry pricing systems and the realization of unified standards for project cost information data across the country. Only standard data can facilitate the classification, classification and processing of subsequent data. At the same time, according to the data of the Engineering Cost Information Data Institute, a unified standard is formulated to support visual information data such as images and videos [4, 5].

2.2 Expanding Data Collection Sources
Although at present, the engineering cost data itself has a huge amount of data, but due to the low data sharing rate, it is basically closed. Many data are not of high quality and utilization rate is very low. [6]. To play the role of big data, we still need to expand the sources of data collection and improve the quality of data. The collected data should include the employment data, material data, and cost reference data of all participating units during the entire project construction process, such as investment decision-making, design, bidding, construction, cost control, settlement, final account, etc. Collect angles and levels of data [7, 8]. In addition, during the data collection process, data sources should be extracted, integrated and cleaned to improve data quality. At the same time, distributed database technology is used to integrate and classify scattered cost data information to absorb more small and medium-sized enterprises without the ability to build their own databases, and then integrate various cost information. It can not only solve the cost problem, but also improve China's competitiveness in project cost management. This is beneficial to expand the business to global engineering construction and enhance international influence [9].

2.3 Strengthen Data Mining and Analysis
At present, China's engineering cost management is in a state of "rich data and insufficient information". Although the project cost data is very large, the corresponding analysis tools are relatively slow. Common algorithms include classification algorithms, sequence mining and clustering algorithms [10]. Foreign data mining technology is relatively developed. Many people open up the Chinese market by analyzing data for free, but in the long run, there are hazards such as over-reliance and information leakage [11]. State secrets are a serious threat to government and business information security. Forming an industrial chain focusing on mining tools with voluntary intellectual property rights is not only conducive to the development of overseas markets, but also to the engineering cost industry, which is useful for development. At the same time, please note the visualization of the mining process and results [12-13]. Project cost visualization research will enable more project cost managers to understand the process of data analysis, have a deeper understanding of the results of big data analysis, greatly reduce the threshold of data management, and increase project costs to make it easier for managers understanding.

3. Experiment

3.1 Analysis of Platform Requirements Based on Questionnaires
Requirement analysis is the first step in platform construction and the basis for platform functional module design. This article uses a questionnaire survey to analyze the needs of respondents and track their specific experiences and opinions. The purpose is to understand the needs of project cost personnel for project cost information, their willingness to share information, and their satisfaction with the information released by the cost station.
3.2 Questionnaire Survey
In this survey, the front-line project personnel of construction units and project cost consulting units are the main targets of the survey. 120 questionnaires were distributed and retrieved through e-mail distribution and recycling, and 96 were recovered with a recovery rate of 80%. Through screening, 86 valid questionnaires were obtained.

The questionnaire consists of the following two parts: The beginning of this article. Explain the purpose, main purpose and significance of the questionnaire to the interviewees, provide guidance for the process of filling out the questionnaire, and explain the method of recycling the questionnaire. The main body of the questionnaire includes 16 questions, including 9 multiple choice questions, 3 multiple choice questions, and 4 open questions. The question is divided into four parts. Questions 1-5 are used to understand the basic information of the interviewees, questions 6-8 are used to understand the types and channels of obtaining cost information, and 9-12 are the opinions and suggestions of cost workers on project cost information. In the cost station, questions 13-14 are the willingness of cost workers to share information, and questions 15-16 are the daily work habits of cost workers.

4. Discussion

4.1 Statistics and Analysis of the Results of the Questionnaire
At present, project cost management in developed countries and regions has begun to use computer networks and information technology to implement project cost management data and networks. There are many excellent construction cost management software in China. For example, many softwares of Guanglian BIM, civil engineering calculations, reinforcement calculations, construction site layout, process drawing drawing review, 5D platform software, etc. It has been integrated into the department's 3D model. In the actual application of the project, various specialized models can be integrated into the BIM 5d platform software to form an architecture model. The BIM business module can be effectively applied to price preparation, contract management, schedule payment management and change management. Finally, cost information for the entire project is stored in the cloud and in a company database for similar projects in the future.

The survey is mainly used to analyze the requirements of the project cost information management cloud platform, and summarizes whether the cost professionals are satisfied with the work of the project cost management department and their views on information sharing. Therefore, the results of the questionnaire survey can be sorted by Excel, which can be used for simple statistics and analysis.

Table 1 shows the basic information of the investigators. 86 workers participated in a questionnaire survey of the cost of front-line projects. Many of them are between 26-34 years old and have 3-5 years of work experience. Respondents are under 45 years old, so please combine the third and fourth options in the first question. Respondents came from engineering units, engineering cost consulting units and design units, covering most major unit types related to construction costs. Unfortunately, the survey did not respond to the construction cost management department. The basic information of the respondents is as follows:

| Problem                  | Option                   | People | Proportion |
|--------------------------|--------------------------|--------|------------|
| Related working years   | Two years and below      | 25     | 29.1%      |
|                          | Three to five years      | 46     | 53.5%      |
|                          | Six to ten years         | 11     | 12.8%      |
|                          | More than ten years      | 4      | 4.6%       |
| Work unit                | Construction unit        | 24     | 27.9%      |
|                          | Construction unit        | 43     | 50.0%      |
| Type                     | Engineering cost consulting unit | 16 | 18.6%      |
|                          | Management department    | 0      | 0%         |
| problem          | Option      | People | proportion |
|------------------|-------------|--------|------------|
| Design unit      |             | 3      | 3.5%       |

It can be seen from the survey that most of the cost personnel of a company can be responsible for a variety of professional cost work, which requires a high comprehensive ability of cost personnel.

4.2 Information Acquisition Channels
62% of workers obtain the latest project cost information from the journals and websites responsible for project cost information at the cost station. Although journals have relatively slow distribution channels, cost workers have provided these key references. This is mainly because compared to other channels, the announcement cycle and the frequency of information updates are relatively stable, the information content is more systematic, and the sender of the information is more authoritative. When new or controversial material price information is obtained through further follow-up interviews, interviewees usually obtain information through recommendations, but are not satisfied with the efficiency and attitude of employee inquiries. The information on the dedicated site is not a system, but distributed. The important basis of using only the information obtained from these sites to reduce costs is that young cost-cutting workers want to obtain project cost information through the Internet, and manage project cost information online.

![Figure 1. Information acquisition channels for cost workers](image)

5. Conclusion
Now is the information age. With the continuous progress of science and technology, the information management level of engineering projects needs to be improved. Each link in the project has a lot of data. Especially under cost control. Big data technology has changed the traditional concept of cost management. In order to promote the computerization of cost management, the level of cost management will be improved. This article establishes a unified cost data collection standard based on big data, which improves the quality of data collection and facilitates subsequent data classification, classification and processing. Increase your data collection sources to make your project costs more competitive. Enhance data mining and analysis, lower data management thresholds, and gain more visibility into project cost management. After analyzing the needs for platforms, engineering agents, and engineering cost consulting companies, frontline engineering cost personnel are the main targets.
of the survey, most of whom have worked for less than 5 years. 62% of people obtain the latest project cost information from project cost information magazines and websites.

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