Information Management System of Engineering Cost Based on Big Data

Fang Wang [1, a *] and Yonglu Gao [2, b]

[1*]Department of Engineering cost, College of Construction Engineering, Yunnan Technology and Business University, Kunming city, Yunnan Province, China

[2]Department of Engineering cost, College of Construction Engineering, Yunnan Technology and Business University, Kunming city, Yunnan Province, China

[a*]446067694@qq.com, [b] 398172642@qq.com

[*]corresponding author

Keywords: Big Data; Engineering Cost; Information Management System; Cost Management

Abstract: The determination of engineering project cost is one of the important contents of engineering project management, but the estimation of engineering cost generally has the disadvantages of large error and long preparation time. With the continuous development of computer science, big data technology is one of the very popular research topics. The purpose of this article is to study the engineering cost information management system based on big data. This article analyzes the cost information collection, cost information storage, platform function maintenance and other aspects of the project cost information management platform, combines the hadoop technology to build the project cost information management platform, and tests the acceleration status and system operation efficiency under the hadoop technology to realize the construction of engineering cost information management platform, and then meet the actual needs of engineering cost information management and information control. The experimental results show that in the relatively small amount of data, the number of data nodes increases, and the processing speed index gradually increases. In the case of a large amount of data, the acceleration ratio is positively correlated with the data nodes. The operating efficiency of the hadoop cluster will gradually increase, and the operating status is relatively stable. When the amount of data is 1 million and the number of nodes is 4, the running time is 10 seconds.

1. Introduction

With the accelerating accumulation of informatization in the engineering field, new technologies represented by the mobile Internet, the Internet of Things, and cloud computing have been widely used in the engineering field [1]. The information subject is rapidly expanding, the engineering cost industry has accumulated huge data resources, and engineering cost has entered a huge data era [2-3]. Data collection, analysis and application are the core content to be solved in the era of big data [4]. Although a large amount of engineering cost information has been accumulated at this stage, the catalogue is complex and different in form. The complete engineering cost database system has not been established [5].

The application of big data in the engineering field has a positive effect on the optimization of engineering cost information aggregation, cost control, cost decision-making and other aspects [6-7]. Combined with the needs of project cost management, the use of big data information to establish a project cost information management platform to collect and control project cost-related information has a leading role in further optimizing the effectiveness of project cost information management [8]. At present, project cost information management is still in the exploratory stage, and the constructed platform still has problems such as insufficient application of information technology and single platform function [9]. Therefore, the actual needs of project cost management and the establishment of a complete project cost information management platform have gradually become the mainstream development trend of cost management [10].

This article analyzes the cost information collection, cost information storage, platform function maintenance and other aspects of the project cost information management platform, combines the hadoop technology to build the project cost information management platform, and tests the acceleration status and system operation efficiency under the hadoop technology to realize the construction of engineering cost information management platform, and then meet the actual needs of engineering cost information management and information control. The experimental results show that as the number of data nodes continues to increase, the operating efficiency of the Hadoop cluster will gradually increase, and the operating state is relatively stable.

2. Method

2.1 Project Cost

The project cost is also the project construction price that we often mention. It covers all expenses, such as fixed funds, intangible funds, tangible funds, material and equipment costs and construction costs of construction projects. The construction cost is not only a one-time investment, but it also covers all the temporary expenses required during the construction of the project, which is the cumulative sum of the various expenses. The cost details in the project cost generally consist of the purchase costs of building materials, equipment rental costs, site contracting costs, construction personnel salary costs and other related temporary construction and renovation costs. The engineering cost is generally composed of two links, namely, the purchase cost of building materials and the rental cost of equipment purchase, and the cost of construction and installation. In our real life, due to the large fluctuations in the prices of building materials and construction equipment, construction units and construction enterprises need to effectively prepare for the eve of construction, and purchase the building materials and equipment maintenance, lease purchase expenses are roughly budgeted to maximize savings. In the process of construction, for the temporary purchase of equipment and building materials, it maximizes the protection of unnecessary expenditures of construction enterprises, realizes the economic cycle effect of construction enterprises, and enables enterprises to effectively save construction costs.

2.2 Specific Functions of Project Cost Information Management Platform

(1) Cost information data collection

The collection of engineering cost information data is based on the actual situation of the project, including the statistics of cost-related basic data. It mainly includes relevant specifications, cost indicators, mechanical equipment information, and supplier unit information. In the research and analysis of project-related information during the cost information collection process, it also needs to include industry dynamic information, engineering cost consulting, and practice information. On the basis of information collection and control, the management and operation of cost information data are realized. In the process of project cost information collection, the internal and external collection of the project cost information management platform is the center. Internal collection is to import relevant basic data under the unified engineering cost information standard, enter engineering cost information, and store it in the engineering cost information database. External collection is to connect with external business software through the engineering cost information management platform to realize the exchange of cost-related information. But in the process of data exchange, it is necessary to pay attention to the format of data exchange, and realize the analysis and storage of data under the premise of data mapping and data storage processing. Different software requires different data file information formats. Therefore, in the process of data exchange processing, it is necessary to collect data in a standard format, which includes labor price, material price, construction machinery price, engineering cost information. And project cost information collection is based on information, such as information resources industrial policy, and the actual situation of the project.

(2) Release of cost information data

The release of cost information data in the engineering cost information management platform is

based on price analysis and price change trends. According to the actual stage and actual situation of the project cost, the manager can release relevant information about the project cost and provide reference for the project cost control and other aspects of the subsequent bidding and other economic activities. On the premise of establishing a project cost management information platform, it needs to be improved from the perspective of data information analysis and data information release, and on the premise of optimizing the service mechanism, to meet the actual needs of project cost management. The publication and update of cost information data is consistent with the collection of cost information data. It is also mainly based on the release of information on labor prices, material prices, construction machinery prices, construction costs, etc. In the release process, it is necessary to include the date, price, and trend of change and other content. During the implementation process, cost management and information release operations need to include the content of the material price market analysis. It is necessary to analyze material specifications, materials, units, etc. On the premise of information release and processing, through the cost information release and information processing, to meet the actual needs of engineering cost management.

(3) Data retrieval of engineering cost information

In order to facilitate customers' query and analysis of engineering cost information, in the process of engineering cost information retrieval and analysis, information data retrieval function can be used to realize construction technology information, cost information, engineering characteristics information, etc. check it out. Retrieving and operating engineering cost information data, users can search for industry dynamics, construction technology, cost control plans and other information through keyword search, thereby achieving the purpose of improving engineering cost management effects. From the search keywords and different information retrieval angles, the engineering cost information retrieval and information operation processing are improved. Through the retrieval control of announcement information and data information, the service effect of cost information is improved.

(4) Data analysis of engineering cost information

The information data analysis of the project cost information management platform is based on the extraction, sorting and analysis of cost information. In order to realize the predictability of project cost information, it is necessary to test and analyze the project cost index forecast and investment estimation. This part is an important part of the information management platform and the core technical part of the management platform. The key is to convert, compare, and output various types of data, because the amount of engineering data is large, and many data sources and formats are incompatible. Finding relevant information from massive data is a complicated process, which requires professional cost engineers and software engineers to communicate fully and establish a complete calculation and analysis system to achieve, and must be different according to time, place, purpose different. Elements, continuous optimization and adjustment, and setting indicators are more difficult links in the information management platform, and are also the ultimate goal of the construction of each platform.

(5) Project cost information maintenance

The project cost information management platform is implemented from the perspective of information management and maintenance costs, basic data analysis, modification of business conditions, user access control, log management, data recovery and backup preservation in the realization of the platform and the implementation process. This is to further improve the project the actual application effect and platform performance of the cost information management platform have a positive effect. The maintenance function of the engineering cost information management platform is the key to comprehensive management of user operations management, business status, log information, data backup, etc., including engineering information, engineering cost, input content for information collection and retrieval, and intermediate cost information. It is implemented on the basis of input and audit control to check the existence status of project cost information, improve the application effect of data information, and further optimize the management of project cost information data. The control effect has a positive effect.

3. Experiment

3.1 The Overall Framework of the System

In the process of implementing the platform framework design, the data integration layer, data storage layer, data processing and analysis are the center. On the basis of optimizing platform functions and parameter configuration, the data integration layer of the engineering cost information management platform is mainly based on data information. Focusing on databases, cost indicators, industry data, etc., through data integration, the processing and operation of engineering cost-related information is realized. The data storage layer is to classify and store the relevant data information of the integration layer through the distributed storage of files. After classifying the engineering cost-related data information, it is also necessary to process and analyze the cost information. In the actual analysis process, a data warehouse is established and integrated and controlled through online analysis. The data output layer is to display the processed data information through the operation of the human-computer interaction interface, and then realize the information conversion of engineering cost management. Under the overall structure of the project cost information management platform, Hadoop technology is used to process cost-related data and information.

In the process of research and analysis of the engineering cost information management platform, the main control node is to control all functional module nodes, use data components to collect and process engineering cost related information, and collect related pictures and videos. Wait for unstructured data to be processed and saved to Hadoop's HDFS. The data query component in the project cost information management platform needs to search for cost-related data through the data index according to the task requirements. In the query process, Hadoop technology is used for cluster processing and analysis, and on the basis of data query and analysis, the project cost-related information is passed to the client.

3.2 System Development Environment

In the process of developing the project cost information management platform, quad-core CPU, 1000M network card and 500G hard disk are used as the basic environment, and Windows 10 is used as the operating system.

4. Discussion

4.1 Experimental Results and Analysis

In the process of analyzing the operating status of the engineering cost information management platform and the actual operation of the hadoop platform, it needs to be improved from the perspective of data analysis and efficiency control. On the premise of optimizing data simulation and data parameters, the Hadoop cluster Run the test. The test results are shown in Table 1 and Figure 1:

Table 1. Experimental results

Data / Number of nodes	1000	10000	100000	1000000
1	1	5	13	20
2	0.6	3	11	15
3	0.5	3	10	13
4	0.4	2	9	10

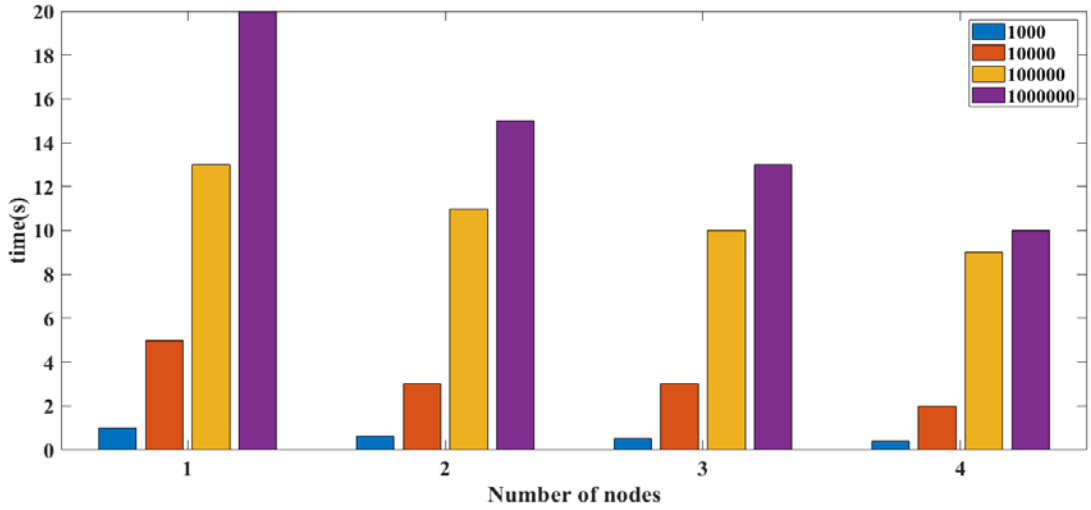

Figure 1. Experimental results

4.2 Methods to Promote the Construction of an Active Service System for New Media Information Knowledge on the Internet

(1) Establish engineering data standards

The reason for the engineering data standard is that the application built on the engineering cost information management platform is to solve the problem of information islands, on the premise of subproject measurement and calculation control, the regional differences in project costs and the target management of data exchange have a positive impact on reducing costs Information data processing time and cost. For example, in the control of engineering materials, it needs to be described in the form of pictures + text, and its data format needs to be carried out under a unified engineering cost data standard to improve the effectiveness and accuracy of engineering cost data information.

(2) Establish a distributed database

In the process of constructing and perfecting the project cost information management platform, it is necessary to use a distributed database to process different data information and combine it with the SQL database to realize the information construction of the project cost database. In the process of implementing the construction and application of the database platform, it is necessary to strengthen database information supervision and data cost work, which has a positive effect on improving the effectiveness and practical application value of project cost data.

(3) Engineering cost data mining and analysis

On the basis of using the engineering cost information management platform, it is also necessary to improve the deep mining effect of cost data, which has a positive effect on the extraction and control of valuable cost information. Based on the realization of classification algorithm control and data mining control, through the application of data analysis and data mining tools, the internal data security and application value of the engineering cost information management platform can be comprehensively improved.

(4) Visual mining and cost data application

Under the premise of data analysis and simulation, the development of engineering cost information needs to be visualized. Based on distributed database applications, through data conversion and data analysis, the actual application effect of engineering cost data information is improved. In order to realize the query and control of data information, in the data release and data query stage, it is necessary to improve the safety, accuracy and cost standards of project cost data, thereby improving the quality of project cost management.

Conclusion

In summary, in the process of studying the engineering cost information management platform, the focus is on improvement in terms of engineering cost management, cost information control,

and cost information data processing. Under the premise of optimizing cost control and information technology application, the actual application effect, cost decision, cost control and other goals of the project cost information management platform are realized. On the basis of optimizing the engineering cost information management platform, it also needs to be controlled from the perspective of engineering data standardization and the establishment of a distributed database. This has a positive effect on further solving the problem of project cost information islands and unknown information classification.

References

[1] Tsuyoshi Shida, Tomoki Oshino, Kazuhiko Tsuda. Extraction Method of Factors Causing Cost Variation of Project Delivery Estimation for Software Development[J]. Ieej Transactions on Electronics Information & Systems, 2017, 137(7):980-986.

[2] Madhu Sharma. Productive System Engineering Cost Estimation Model[J]. International Journal of Computer Applications, 2017, 173(5):1-4.

[3] Vesna Janjić, Nemanja Karapavlović, Jelena Damjanović. TECHNIQUES OF STRATEGIC COST MANAGEMENT – THE CASE OF SERBIA[J]. Teme, 2017, 41(2):441-455.

[4] Prakash S S B, Yarlagadda S. Efficient cost management of materials in conventional and precast construction[J]. international journal of civil engineering & technology, 2017, 8(1):307-311.

[5] S. A. Rehman Khan. Today's World: Lean Manufacturing Environments and Cost Management[J]. Journal of Investment Management, 2017, 6(4):87.

[6] André O. de Araujo, Mauro Rezende Filho, Floriano C. M. Pires. A ship construction cost data management system[J]. marine systems & ocean technology, 2017, 12(3):93-103.

[7] Ryan Bradley, I S Jawahir, Niko Murrell,. Parallel Design of a Product and Internet of Things (IoT) Architecture to Minimize the Cost of Utilizing Big Data (BD) for Sustainable Value Creation[J]. Procedia Cirp, 2017, 61(11):58-62.

[8] Hanshuang DENG. Research on Pharmaceutical Engineering Innovation Based on Big Data Analysis[J]. boletin tecnico/technical bulletin, 2017, 55(7):562-568.

[9] Tan Ge. Application prospects of big data in engineering cost [J]. China Electric Power Enterprise Management, 2018 (9): 44-45.

[10] Chen Shan. The Impact of BIM on the Engineering Cost Industry in the Big Data Era and Countermeasures Analysis [J]. Building Materials and Decoration, 2019 (19): 189-190.