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A system for tender price evaluation of construction project based on big data

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Abstract

Tender price evaluation of construction project is one of the most important works for the clients to control project cost in the bidding stage. However ,the previously underutilization of project cost data made the tender price evaluation of new projects lack of effective evaluation criterion, which brings challenge to cost control. With the improvement of companies' information technology application and the advent of big data era, the project cost-related data can be completely and systematically recorded in real time, as well as fully utilized to support decision-making for construction project cost management. In this paper, a system for tender price evaluation of construction project based on big data is presented, aiming to use related technique of big data to analysis project cost data to give a reasonable cost range, which contributes to obtaining the evaluation criterion to support the tender price controls. The paper introduced the data sources, data extraction, data storage and data analysis of the system respectively. A case study is conducted in a metro station project to evaluate the system. The results show that the system based on big data is significant for tender price evaluation in construction project.

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Keywords: System; Bid price evaluation; Construction project; Big data

1. Introduction

It is of great significance for clients' construction projects success to carry out construction cost management during bidding stage. The clients want to make projects be built with limited economic resources; while the bidder is in pursuit of maximum economic efficiency [1, 2]. Therefore, during the construction project bidding phase, clients evaluate bids submitted by bidders, which we called bid evaluation——mainly considered on the basis of economic

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standards and technical standards.. Evaluation of the technical standards often can get perfect results with the support of experienced technical experts. However, as for evaluation on economic bid, due to the technical dependency of project cost, and market-related prices and other characteristics in economical bid， there exists some limitations in current economic evaluation, including mainly focusing on evaluating the total price and unbalanced quote as well as difficulty in assessing the price of engineering projects subheadings [3]. Kunhui Ye(2013)pointed that the factors in compiling tender prices were complicated and used a mix of research methods findings the key factors[4]. The method of limiting score within the bidding price was used in bid evaluation, which setting control range for bid prices which participate in rating (typically + 3% to -8%). The bidder whose bid price is over this range will lose qualification for bid evaluation and bid wining. This evaluation method adds to the risk of revealing base price. Reasonable low price bid evaluation method is used in construction projects in China now.it is also called multi-criteria method, which focus on the evaluation of the price. The arithmetic average of bidders' price and price from cost consulting company are the two main ways to get the tender price. The former method usually leads to tender price higher artificially under the condition of incomplete competition market for bidders' own interests and price "distortion" duo to together-conspired bidding. The latter method produces a time lag on the quota cost reference compiled by cost consulting company for previous cost data underused [5]. How to evaluate the reasonableness of the tender quoted price has become an important issue for successful bidding. Solution to this problem is to make full use of previous project cost data, conducting data mining analysis and providing a reference for tender evaluation of new construction projects. Before the advent of the era of big data, construction project cost data did not get deserved attention, which was reflected in that the project cost data was frequently narrowly thought as the project cost report data. Data storage formats and storage media are different, as well as serious data partitioning, etc. Ballesteros Pérez etc.(2014) built a new bidding model, as a practical tool, was used to improve bidders' strategy and increase their chance to win the contract before bidding based on experience and cost data .It called Smart Bid Model, but this model is mainly used in capped tendering[6].

From the perspective of big data, the concept of project cost data should be generalized, including engineering information data, construction cost data and technology scheme data etc. And the types of these data include documents, forms and other types. Considering from the amount and updates of data, project cost data has typical features of big data: large, emerging quickly, multi-sourced and heterogeneous [7, 8]. Big data technologies application in the Internet, medicine and other fields can provide reference for construction cost management. The most typical cases are that Google predicted the occurrence of flu and Wal-Mart's marketing of beer and diapers [9, 10]. At present, it is rare to see introduction of relevant storage and analysis technology of big data based on traditional relational database for conducting cost control during bidding phase in construction cost management field [11-13].

The main purpose of this article is to use big data technologies to study quoted price evaluation in cost control during construction bidding phase. The project cost data collection, extraction, storage, transmission and analysis are carried out and engineering subheadings reasonable price range is obtained in this paper, which is reasonable to evaluate the bidder's tender price, and the decision support system platform was developed.

2. Big data and related technology

2.1. Big data

With the all-round development of network and hardware facilities such as sensor and server, the era of big data has already come. Big Data technologies promote many firms to integrate their needs, creating unimaginable economic benefits, and achieving great social value with high commercial potential. Different industries use big data to generate great value and benefits, which shows unprecedented social potential not just the data itself. As for academia, Nature has launched a special issue of Big Data in 2008[14]. In February 2011, Science launched the special issue "Dealing with Data", mainly discussing the problems of big data scientific and explaining the importance of big data science [15].

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