

Application of Index Weighting System in Large-scale Construction Project Management

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Abstract: Aiming at the requirement of immediate analysis, correction and determination in the index weighting of large-scale construction project management, this study based on the integration of project theories and practices, built and developed index weighting system for large-scale construction project management by means of computer technology, then applied it to some new-built construction project. The application results show that there could be more accurate and scientific to analyze and evaluate the status of the project by using the system, and the system provides a new tool for engineering projects with more effective control.

Introduction

Nowadays, with the development of science and technology, the level of engineering project management in China has greatly improved. At the same time, the requirements of large-scale construction project management are also increasing. In order to achieve the management goal, we need to use comprehensive evaluation method to analyze the project. But due to indexes of analysis and evaluation of large-scale construction project are large quantity and project management targets change with project progress synchronously, so indexes must be well targeted when they are used in comprehensive evaluation, and their weights must be adjusted and corrected with the progress of the project according to changing of managed objects^[1]. It makes the progress of determining the indexes weight distinct dynamic and weight should be adjusted instantly. For this reason, this paper proposed the index weighting system for large-scale construction project management which integrated the theories and practices of project, and developed by means of information technology, then applied the system to a new-built construction project.

Index weighting system

Index weighting system functions outlined

To achieve the goal of dynamic index weighting and instant adjustment in large construction project, combined with the need of project management, we can know that a index weighting system for a project management must have the following functions: 1) importing comprehensive evaluation index system; 2) scoring the importance of comprehensive evaluation index; 3) managing evaluation model.

Therefore, combined with management requirement of project, index weighting system for large-scale construction project which will be built in this paper must have six modules as follows: 1) module of selecting index system, in which users can select corresponding index system according to detailed project information; 2) module of scoring index, in which experts can analyze and evaluate the importance of indexes at all levels^[2]; 3) module of counting results, in which

administrator can compute the result of importance and diversity of indexes according to statistical results, then compute the result of weighting analysis.

Features of index weighting system

To achieve the goal of dynamic index weighting and instant adjustment, the index weighting system for large-scale construction project management must have the following features:

(1) Scientific and reasonable statistical results. The large sample analysis results of all kinds of experts should be included in the system analysis when determining the index weighting. The method of weighting should be scientific and reasonable, which can reflect the real status of the project.

(2) Instant dynamic adjustment. Computer technology should be fully used, so that indexes and their weights change synchronously when the project managed objects change, which is advantageous for managers to grasp management points.

Design and implementation of index weighting system

According to the above requirements, under the basic design principles of practicability, expansibility, maintainability, safety and reliability, using Browser/Server structure, MySQL as data base management system, MyEclipse as software development environment, Tomcat7.0 as server software, the index weighting system for large-scale construction project management is developed under the framework of SS2H platform based on J2EE with making use of object - oriented modularity structure and style of Java^[3]. Parts of users interfaces of the management index weighting system is shown as Fig.1.



Fig.1 user interfaces of the management index weighting system

Application Example of index weighting system

This paper takes one large-scale construction project in X city for an example to prove the efficiency of the index weighting system of large-scale construction project management. The large-scale construction project is Star-cove residential areas construction project in X city. To ensure that the construction project is in control, and the construction task can finish on time, the index weighting system for large-scale construction project management has been used in the whole construction process of the project management.

Implementation process of index weighting system

The implementation process of the index weighting system of large-scale construction project management is that firstly administrator stores index system corresponding to construction project into the database system, then experts who have entered into the LAN input the system's website in browser and enter, import the index system to be amended and score the importance of index.

When the number of experts who scored for the index reaches a certain quantity, the consequence of importance, diversity and weighting analysis of index will be got based on the exclude & compare difference degree technology which is universally acknowledged in project management^[4]. When experts and users have any objection, administrator will take corresponding measures after they send internal letter to him. The flow diagram has been showed as Fig.2.

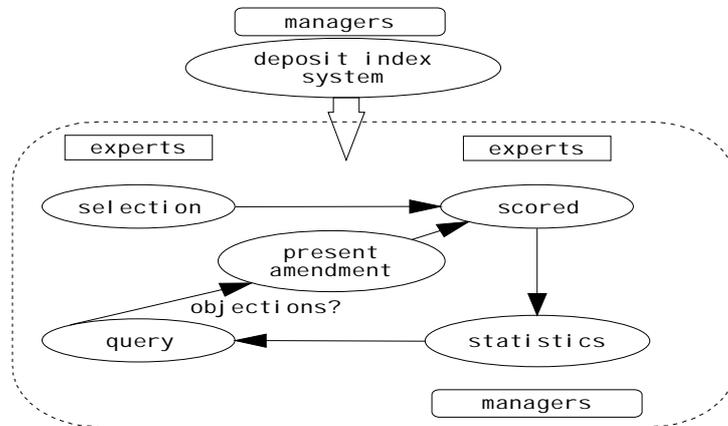


Fig.2 management process of management index weighting system

Application process of index weighting system

Now we take the date of December 10th, 2014 as the example, the day on which the project was in construction stage. 65 experts were invited to score for management index at first, second, third level according to the request of project managers. The interface of scoring for second level is showed in Fig.3. When the number of people who scored has reached 65, managers click [Statistics], then get a analysis result of scoring summary(Fig.4), diversity, importance and weighting(Fig.5) of this project construction stage index at all levels.



Fig.3 interface of scoring for second level

Fig.4 result of scoring summary



Fig.5 result of diversity and importance

Fig.6 result of weighting analysis

Diversity and importance analysis are used to judge whether there is strong relativity among indexes. On the basis of concerned theory, when two indexes' diversity is less than 0.5 or either index's importance is less than 1.5, the index can be replaced by the other index which is very closely related to it. From the result of diversity, importance in Fig.5, we know that some indexes should be deleted, for example, the diversity between index "the rate of supervised properly in process" and "the rate of safeguard measures adopted" is 0.21, so the former should be deleted. The analysis results also confirm that in scoring, a few experts send internal letter to administrator to reflect the issue of "there are several indexes which have similar function and can be omitted or replaced in the index system".

Indexes in different stages and levels have different importance, the share of each index's importance in the group which consisted of it and its relevant indexes is its own weighting^[5]. So we can determine weightings of all indexes, then form holonomic index system with indexes and their weightings. From the result of weighting analysis of indexes at first level in Fig.6, in construction stage which the project is in, the weighting of construction quality, timing control, cost and resource guarantee is 0.15, the weighting of construction safety and risk is 0.13, the weighting of environmental protection condition is 0.07, so the management goal should focus on construction quality, timing control, cost and resource guarantee primarily, safety and risk management secondly. Then we check the weighting of indexes at second and third level, so the management points in this stage can be found by specific index.

Through the process of the project management, project managers used the index weighting system for large-scale construction project management from beginning to end in order to check the feasibility and effectiveness of this system systematically and entirely. Practices show that it can be timely, true and efficient to determine weighting of each index when using the system. Emphasis of management that the index weighting reflects fits the actual results of project to more than a percentage of 95, which proofs that the system provides project managers with powerful and reliable technical supports in immediate analysis, identification and handling factors that may bring adverse effect to the normal operation of the project.

Conclusion

In development and application of index weighting system for large-scale construction project management, we combined the requirement of dynamic index weighting and instant adjustment in construction project comprehensive evaluation with construction project information integrated management system, set up an easy-operated, practical and efficient index weighting system, by the means of project management theories and information technology. The result of application indicates that realization of this system simplifies the process of index weighting, in addition, emphasis of management reflected in the index weighting provides managers a powerful support in analysis and diagnosis the status of the large-scale construction project. The system increases efficiency of management, flow velocity of information and extent of data sharing, which has high practical value.

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