Research on management information system of capital construction project in large hospital

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Abstract. Hospital infrastructure project management information system is a project management information system, which is based on scientific management system and covers all departments of the hospital, including supervision, design, civil engineering, equipment and other construction units. This paper focuses on the subject of the bidding management of the information management system of the hospital infrastructure construction and the high-performance management system of the hospital infrastructure construction, aiming at the problems of large business volume, complex management process, difficult bidding management, and information cannot be shared in time.

1. Introduction

The rapid development of Internet technology has a huge impact on all aspects of social life. The medical business and management of hospitals and medical institutions are also developing towards informatization. Improving service quality is the only way for medical development. Infrastructure project management is the key point of hospital management.

With the introduction and development of Engineering Management in China, the management information system of infrastructure engineering has developed rapidly since the mid-1980s, and has made remarkable achievements. Since the rapid promotion and development of PC and CAD technology in China, some relevant colleges and universities and design research units have successively researched and developed the project model and management system based on GIS. The development of this system has been applied to some fields such as water conservancy, transportation, earthquake disaster prevention, civil engineering, etc. So far, the management information system of infrastructure engineering has made remarkable achievements in some fields of our country.

The management of some major construction projects in the hospital is undertaken by the internal infrastructure construction Department of the hospital. Therefore, the establishment of a set of management information system is of great significance for all aspects of the project, including planning, project approval, design, bidding, project quality management, progress management, capital management, completion management and other management. In this paper, a hospital project infrastructure management information system is studied.

2. Introduction to infrastructure project management system

This section introduces the infrastructure project management system from the meaning of the infrastructure project management system, the significance of establishing the infrastructure project management information system, and the classification and characteristics of the infrastructure project management information system.
2.1. Meaning of infrastructure project management system

Infrastructure project management system is a management system that can realize the integration of project data collection, project material use, project amount accounting and project plan supervision, and can accurately reflect the operation status of the project. The system involves many units and projects, including contract management, bidding management, supplier management, engineering equipment management, data management, quality management, plan management and other management modules. The basic framework of the infrastructure project management information system of the unit is formed by extracting relevant contract, material, quality inspection, plan statistics, drawings and other data information from each department of the unit.

So far, although the construction project management information system has made great success and progress in China's construction projects. However, in terms of the current application effect in China, there are still many problems to be solved in this system, especially in the management of hospital infrastructure projects.

2.2. The significance of establishing management information system of capital construction project

The establishment of infrastructure project management information system can realize the transparency of infrastructure project supervision and management, improve management efficiency, realize information sharing, and ultimately achieve the purpose of reducing project waste, improving project quality and reducing the risk of infrastructure project management.

The establishment of the management information system of infrastructure projects has the following four practical significance [1]:

① It is conducive to strengthening the scientific management of infrastructure projects, with the help of the project management software, to reasonably control the progress of project construction, the investment of funds, and to timely understand the management information of infrastructure projects.

② It is conducive to the accumulation of information resources, that is, the preservation of data. In the process of infrastructure project management, the parameters, drawings and manuals of construction equipment are important data, which are indispensable for future production. If it is managed and handed over in the traditional manual way, it is complicated and easy to lose and disorder. If we can store and plan the data in digital way according to the principle of information system construction, and make use of the data in the way of information integration, it will bring great convenience and considerable benefits to the enterprise.

③ It is helpful to solve the problems of isolated information island, complexity and non-transparency of hospital management, and then to maximize the sharing of various information resources.

④ It is beneficial to improve the management system of infrastructure projects, so that new employees can be familiar with the work process and master the work methods when they are on duty, so as to establish a new management concept.

2.3. Classification and characteristics of management information system of infrastructure project

The infrastructure project management information system (PMIS) generally includes four functions: project schedule control management system, project safety control management system, project quality control management system and project investment control management system. [2] As shown in Figure 1.
Figure 1. Infrastructure project management information system.

Infrastructure project management information system is an information system which is simplified and integrated by several functional subsystems. Its characteristics are: unifying information format, simplifying data statistics and collection, reducing information cost; timely providing project information with different needs and different degrees of concentration for rapid analysis and correct control of the project; convenient and rapid in project management decision-making. In order to make decision-making more scientific, we should provide complete and detailed project information and establish mathematical model according to the existing information.

3. Case study

Based on the characteristics of long production cycle and complex cooperation relationship of large-scale hospital construction project, this paper takes the material supplier of large-scale hospital construction project as the research object, and according to the objectives and principles of supplier evaluation and selection, namely, qualitative and quantitative principles, accuracy and comprehensiveness principles, reconfigurable and expandable principles, decision-making and timeliness principles, aims to solve the basic construction of hospital. For the practical problems in the design, establish the supplier AHP evaluation system model in line with the construction of large-scale hospital infrastructure project, and the application of this system model should fully meet the evaluation requirements of the construction of infrastructure project for suppliers, and can comprehensively and objectively help the purchaser to select the best supplier.

According to the relevant principles of index selection and evaluation of material suppliers of large-scale hospital infrastructure projects and the actual situation of supplier management of large-scale hospital infrastructure projects, the selection and evaluation process of suppliers are analyzed in three aspects of economic benefit, cooperation fit degree and social benefit. On the basis of relevant investigation and research, this paper puts forward a scientific and effective comprehensive evaluation index system for suppliers of large-scale hospital infrastructure projects. As shown in Table 1.
Table 1. Comprehensive evaluation index system of three levels.

| Target layer | Criterion level | Index level | Index type | Data sources |
|--------------|-----------------|-------------|------------|--------------|
| Supplier evaluation and selection system of a hospital infrastructure project | Enterprise competitiveness C1 | Price C11 | Ration | Formula calculation |
| | | Product quality C12 | Product qualification rate C121 | Ration | Formula calculation |
| | | | Return rate for repair c122 | Ration | Formula calculation |
| | Flexible C13 | Batch flexible c131 | Ration | Formula calculation |
| | | Product flexibility c132 | Ration | Formula calculation |
| Cooperation fit C2 | Tissue compatibility C21 | Qualitative | Formula calculation |
| | Product specificity C22 | Qualitative | Formula calculation |
| | Transaction price C23 | Ration | Formula calculation |
| | Channel dependence C24 | Ration | Formula calculation |
| Social benefits C3 | Environmental impact degree C31 | Ration | Formula calculation |
| | Energy consumption C32 | Ration | Formula calculation |
| | Recycle C33 | Ration | Formula calculation |
| | Environmental reputation C34 | Qualitative | Experts score |

Source: Self drawn

The fuzzy analytic hierarchy process (AHP) is introduced to evaluate the engineering project suppliers. This method can simplify the evaluation process of the complexity of the engineering project suppliers by decomposing into multiple groups. On the basis of comprehensive research and analysis, aiming at the difficulties of consistency test in AHP and some practical problems such as the differences between judgment consistency and matrix consistency, the fuzzy analytic hierarchy process is used to build the fuzzy consistency matrix. The following conditions should be met to construct the fuzzy consistent matrix:

If fuzzy matrix \( R = (r_{ij})_{m\times n} \) satisfy \( \forall i, j, k \) A kind of

\[
r_{ij} = r_{ik} - r_{kj} + 0.5(i, j, k = 1, 2, \ldots, n)
\]

Then we call the fuzzy matrix \( R \) the fuzzy consistent matrix.

Especially when \( i=j \) At that time, \( r_{ij} = r_{ik} - r_{kj} + 0.5 = 0.5 \). It should also be true, so the complementarity of our fuzzy consistent matrix has been verified, that is: \( \forall i (i = 1, 2, \ldots, n) \) Yes \( r_{ij}=0.5 \) Established.

In the process of comprehensive evaluation and selection of suppliers by fuzzy analytic hierarchy process, we generally use the "two by two comparison method" which we know and are familiar with at present to determine the weight of evaluation indexes.
The multi-objective supplier evaluation system and its model established in line with the construction of infrastructure projects are helpful for hospitals to conduct multi-criteria dynamic evaluation on suppliers and select the best suppliers.

4. Conclusion

Large hospital infrastructure project management information system is a relatively large-scale system, involving a wide range, so we should consider many factors. The infrastructure management information system starts from the actual business needs of the hospital, realizes the comprehensive supervision and control of all links of the whole business chain of quality management, safety management, progress management and investment final accounts, and constructs a comprehensive, three-dimensional and safe supervision network from the dynamic change information of the supplier's personnel information, material and financial information and all kinds of information. It can be used as a model for the construction of infrastructure supervision information system in other hospitals.

References

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