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Using XML to support information exchange in construction projects

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Abstract

With the application of information technology, many parties involved in construction projects have turned to handle the management information using computer systems among themselves, while they still exchange information on papers between them. It has introduced such deficiencies as inefficiency of collaboration and re-entry of data in the management of construction projects. This study aims to develop a system for the parties in construction projects to collaborate on Web to improve the management of the exchanged information. In this paper, the characteristics of the exchanged information in construction projects in China are summarized based on the literature survey and field investigation, and a Web-based approach to developing a system for the management of exchanged information in construction projects is proposed. Then the prototype system that we have developed by using the latest information technologies including eXtensible Markup Language (XML) is examined and its applicability is discussed.

Keywords: Construction projects; Management information systems; Collaboration; Web-based

1. Introduction

1.1. Every construction project of medium to large scales of construction process

According to the scope of information, the information management in a construction project can be divided into two categories, i.e. the management of internal information and that of exchanged information. The former denotes that within each party, for example, the information management within a contractor; while the latter denotes that across at least two parties to collaborate their activities. In the past decade, the way of the former has changed a great deal due to the use of computer systems, while that of the latter remains old-fashioned, i.e. the information is submitted in paper form and handled by signing manually.

Major shortcomings can be identified for the old-fashioned management of exchanged information. Since the information in the computer in one party has to be printed out on paper in order to be submitted to another one, the information in paper form has to be re-entered by the other party to manage it by using a computer. In addition, the movement of information is slow and expensive so that the collaboration among the multi-party is not efficient. It is obvious that the shortcomings can be overcome by utilizing the infor-

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mation and network technology that prevails in recent years.

Researches on collaborative systems for Architecture/Engineering/Construction (AEC) industry have been carried out for several years. Teicholz and Fischer [1] proposed the concept of Computer Integrated Construction (CIC) to integrate the project participants in design and construction based on object-oriented model. Anumba [2] pointed out the need for tools that provide collaborative environment for construction management. COMMIT project [3] clarified for the first time the important issues regarding the information management in collaborative environments, such as ownership, versioning, etc. These studies partly solved the basic problems for the collaboration of parties in construction, but they are hardly applicable to the practice as a whole. Ma and Itoh [4] conducted a study on road lifecycle information management systems and developed a prototype collaborative system on Web. However, the system was not flexible to adapt to new specifications on information management.

This study aims to develop a system for the multi-party in construction projects to collaborate on Web to improve the management of the exchanged information. In this paper, the characteristics of the exchanged information in construction projects in China are summarized based on the literature survey and field investigation, and a Web-based approach to developing a system for the management of exchanged information in construction projects is proposed. Then the prototype system that we have developed based on the approach by using the latest information technologies including eXtensible Markup Language (XML) is examined and its applicability is discussed.

2. Characteristics of exchanged information

Since the late 1980s, a new delivery framework has been introduced in construction industry in China to cope with the market economy. In the framework, owner, designer, contractor and engineer constitute the major parties for a construction project and they collaborate according to the contracts signed between them and the specifications issued by the government [5,6]. Imaginably, a large amount of information is exchanged in the form of document in the collaboration. For example, in a pilot project (a five-storey dormitory building with the building area of about 7000 m^2) of the prototype system developed in this study, more than 600 documents were exchanged among the multi-party within 5 months from the beginning of construction to the completion of the main structure.

The information exchanged among the multi-party for collaboration includes documents regarding scheduling, cost control, quality assurance and contract management. Each type of information has its own specific forms. For example, the information regarding scheduling includes the report forms of construction start, total schedule, monthly schedule, monthly statements, and notice from engineers, etc. Each form should be prepared and submitted by a certain party, checked and/or determined by others. For example, the report form of monthly schedule should be prepared and submitted by the contractor, determined by the engineer. In addition, some of the forms have to be submitted along with some appendix. For instance, the report form of monthly schedule has to be submitted along with the plan for the schedule, quantity survey, and list of equipment.

Normally, the information that is exchanged in the construction process is not only necessary but also meaningful for the related parties in different ways. For example, by submitting the monthly schedule, the contractor promises the progress of the project; the engineer compares the monthly statements with the corresponding schedule to check if the project goes as scheduled; and the owner prepares the upcoming payment according to the schedule. In addition, each party may examine the statistics of certain information items such as payment amount.

It deserves to note that the information forms are specified in the government specifications and subject to change every several years. Besides, depending on the characteristics of the construction project, some forms may need to be created and added for a particular project.

3. Approach

At least three alternative ways on Internet are available to be used for conveying information among multi-party. They are email, File Transmission Proto-