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Web-based construction project management systems: how to make them successful?

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Abstract

This paper describes research conducted at Purdue University on the identification of factors determining success or failure of web-based construction project management systems, particularly through the use of application service providers utilized by construction firms without in-house expertise to develop such systems for exclusive company use.

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1. Introduction

The construction industry is fragmented due to the many stakeholders and phases involved in a construction project. This fragmentation has led to well documented problems with communication and information processing and has contributed to the proliferation of adversarial relationships between the parties to a project. This fragmentation is also often seen as one of the major contributors to low productivity in construction.

Information Technology (IT) is now routinely used in the construction industry as a tool to reduce some of the problems generated by fragmentation. The use of IT improves coordination and collaboration between firms participating in a construction project,

leading to better communication practices. Its benefits include an increase in the quality of documents and the speed of the work, better financial control and communications, and simpler and faster access to common data as well as a decrease in documentation errors. IT spending in Architecture/Engineering/Construction (A/E/C) firms has increased significantly during the past few years [1], indicating that A/E/C firms are increasing their interests in IT applications to facilitate construction projects.

Among all IT applications, the Internet is the technology that best facilitates a collaborative working environment in a construction project. Walker and Betts [2] postulated that the Internet, and more specifically the World Wide Web (WWW), will be the key to a change in global construction business in the near future and will impact professions, collaboration, and the construction business structure. Its use as a communication medium can help information transfer occur faster and more effectively and enable new opportunities for the development of

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distributed systems that can cross organization boundaries and provide a unique opportunity for teamwork and workflow automation. The Web can also overcome the incompatibilities of data formats through smart browsers and servers. Therefore, independent project participants using different hardware platforms can share the same system over the Web [3]. As described in Skibniewski and Abduh [4], the advantages of Web technologies in construction can be broadly categorized into three areas: the support of relevant information services, communication between project participants, and engineering and management computing.

Recently, a concept of how the Web and its associated technologies can be used to manage construction projects has been widely acknowledged by practitioners. This concept is often referred to as a Web-based Project Management System (WPMS)¹ and promises to enhance construction project documentation and control and to revolutionize the way in which a construction project team conducts business. WPMS is an electronic project-management system conducted through the Extranet, which is a private network that uses Internet protocols to transmit information. The system is only accessible by a project team, but team members can be located in different organizations. It basically provides a centralized, commonly accessible, reliable means of transmitting and storing project information [5]. Project information is stored on the server and a standard Web browser is used as a gateway to exchange this information, eliminating geographic and boundary hardware platform differences. Fig. 1 illustrates the basic functional scheme of WPMS [7].

As pointed out by Mead [6], there are four general categories of construction project information that are normally carried out through WPMS: project, design, management, and financial information. Project information includes details about the project, such as project participants, project e-mail directory, project description, and a photo archive of the project's progress. Design information in-

cludes any information generated by the design team, such as CAD drawings, specifications, clarifications and changes, and punch lists. Management information is developed by the project manager and includes meeting minutes, submittals and shop drawings, change order status logs, as-built drawings, requests for information (RFIs), requests for quotation (RFQs), contract status logs, safety information, daily logs, and project schedules. Financial information is developed by the accounting staff responsible for the project and includes cash flow, projections, requisition status, general ledger, and contract status reports.

As project information changes, the database on the server can be easily updated with new data. Members of the project team can then access the updated information via a digital user ID and password from remote locations at any time, eliminating the problems that occur in linear communication schemes [8]. Since a closed network is used where no one is allowed to access the system without permission and everyone is identified (through an individual user ID and password), the system can automatically track who has seen what, and what comments or changes if any, they made. It is also possible to introduce a project hierarchy into the system, which allows documents or areas of the project to be restricted to only people at certain levels of responsibility, etc. Hence, the mistakes caused by poor communication and the delays due to the time it takes to move documents and people around for approvals and meetings would be minimized. WPMS is predicted to significantly improve the speed and quality of communication among project participants and promotes collaboration and coordination in construction projects [8,9].

Engineering News Record (ENR) in the United States reports that the number of A/E/C firms using WPMS has risen by 16% within the past 2 years [1]. It is also estimated that the number of A/E/C firms prepared to set up "virtual" project teams by using the WPMS concept is doubling every 6 months. Currently, there are three options in regard to WPMS implementation. The first option is to develop a customized WPMS in-house by hiring either a consulting company or programmers to create a system. The second is to develop a WPMS by purchasing commercial web-enabled packaged software and installing it on

¹ Other names are also used to denote WPMS, including Document Management System, Project Extranet, Project Web, Project Bank, Project Specific Website, Document Pool, Project Information Management System, and Virtual Project.

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