Interoperability in Construction Software Solutions: Re-Inventing Web Based Project Management

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Abstract

Technologically advanced construction companies are seeing the benefits of real time information by using internet-based project management software. The drawback with existing web-based project management systems is that they are not always compatible and may not be able to exchange information with other databases in a corporation, such as an accounting system. A recently published study from the National Institute of Standards and Technology finds that building owners, operators, and their allies in the United States could save at least $15.8 billion a year through better coordination of electronic data. Data exchanged among these participants is typically retyped several times into various software packages. This paper describes how contractors may use extended markup language (XML) based forms to easily collect data from the field. This data may seamlessly integrate into existing databases without very little intervention. The paper presents a case study of how one construction company used Microsoft Web-Services combined with XML technologies to deploy enterprise wide project management solutions that are not totally dependent on the internet. A comparison of adopting 'Off-The-Shelf' solutions as opposed those developed 'In-House' is presented. The author summarizes how late adopters of information technology in construction may spend less money to implement these technologies as compared to companies that were early adopters of web-based project management systems.

Keywords

Web-Based Project Management, Interoperability, Extended Markup Language (XML), Microsoft InfoPath.

Introduction

The construction industry is fragmented by nature (Faraj & Alshawi, 1999). This fragmentation is not restricted to the US construction market alone but is more of a global phenomenon (Kazi & Charoenngam 2003). One of the primary reasons this fragmentation exists is due the participation of various trades in developing the finished product, the 'Building'. Priorities of these trades are not all the same and are sometimes even at odds with each other. From an information technology stand point the fragmentation exists due to the various levels of technical expertise available for these participants within their organizations. As an example while the internet and web based project management software were gaining

popularity, in 2001 it was estimated that approximately 75% of subcontractors did not use e-mail (Rogus, 2001).

Accurate information that is gathered in a timely fashion is the key for successful decision making in any organization. In many construction companies, gathering information from a remote job location is often a tedious task and is rarely done without some lag time. It requires considerable capital to participate in internet based project administration and consequently several construction companies have not implemented these technologies. These firms rely on outdated methods such as Fed-Ex or E-mail or a Fax Machine to transfer data. These methods are inefficient since this information needs to be retyped into another database or software at the main office. A recently published study from the National Institute of Standards and Technology finds that building owners, operators, and their allies could save at least $15.8 billion a year through better coordination of electronic data. Data exchanged among these participants is typically retyped several times into various software packages. The report also states that a number of factors were not included in the analysis and therefore this estimate is considered to be quite conservative.

Interoperability in Construction Software

Web based project management is a very useful tool in an industry where the core function of a company is conducted on the client's premises as opposed to a warehouse or a factory. In a survey conducted in 2003 by Constructech magazine of over 100 contractors, 86% of the respondents considered project management software as significantly important over other software (Guinta, 2003). It has helped immensely by allowing the various participants in a project to communicate with each other. It has enabled contractors to remotely monitor the progress of jobs and predict the overall performance of the company in a more real-time manner than in the past. As an example the vice president of operations in a construction company can check to see the financial health of a project from the corporate office on a computer screen as opposed to waiting for all forms to be returned to the home office via fax machine or regular mail. However, for the chief executive officer to determine the health of the overall company, information from all projects must be summarized at one single location to effectively make a decision. The problem in doing that is far more complicated in that the native data in the accounting system and the data in the project management system do not communicate with each other. Hence companies that have invested significantly in web-based systems and accounting systems now have to invest more funds to re-enter information from one system to another. This paper discusses the problems associated with this incompatibility and the solutions that are available for contractors to use. Due to similar situations in several non-construction software as well, the World Wide Web consortium has created the markup language XML. It allows software applications to share data rather than having to re-enter it manually from one application to another.
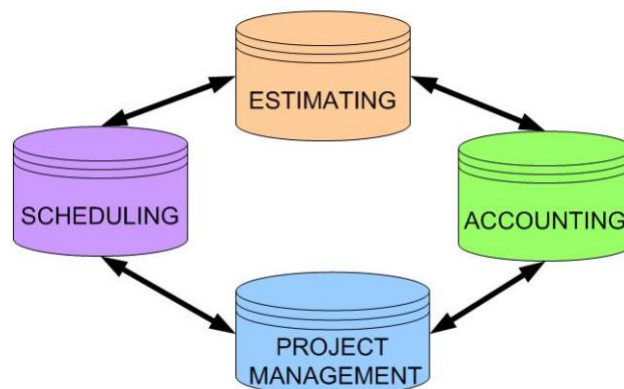

Figure 1: Interoperability within Various Construction Management Software Programs

Data that is stored in a software program is in a format that is native only to that software programs. For example a project management system could refer to a column in its database as 'Contract Amount' whereas the accounting system may refer to the same information as 'Contract Total'. Due to the lack of a standard within these software makers, these two programs cannot communicate with each other. XML enables software programs to have common schemas allowing them to be able to share data. There are two types of documents in XML, namely an 'XML Schema' and an 'XML Document'. XML schema is a definition of the information that is present in a document and an XML document actually contains that information. The schema contains data definitions that are relevant typically to several software applications. As an example it might contain information that is relevant to both project management and accounting software and the 'Contract Amount' discussed in the example above would have the same meaning in both software programs.
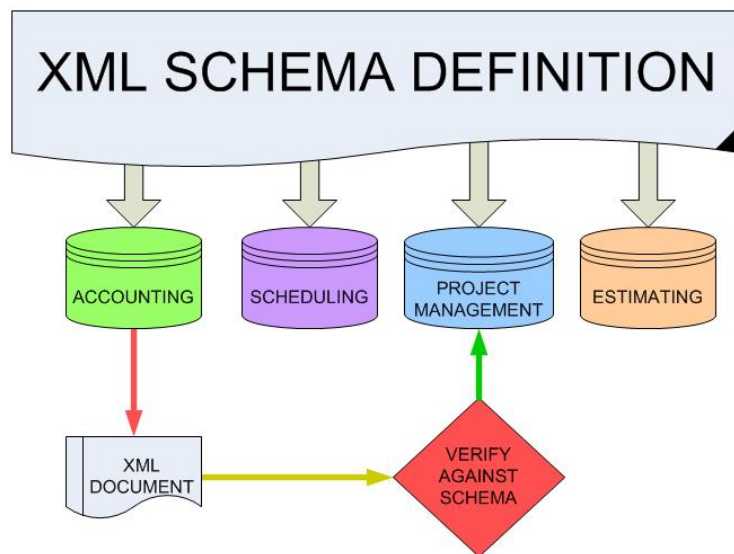

Figure 2: Use of XML for Interoperability in Construction Management Software

Off the Shelf Solutions Vs In-House Solutions

Microsoft Office is one of the most popular software packages in the construction industry. Microsoft InfoPath is the latest software in the Microsoft Office Suite. This program is designed to gather information flexibly and efficiently in rich, dynamic WYSIWYG (What You See Is What You Get) forms and more effectively share, reuse, and repurpose information throughout an organization. InfoPath 2003 helps improve collaboration and decision-making to positively impact an organization. Unlike Microsoft Word or Excel, this is a brand new product in the Office Suite and its potential is not fully garnered by the construction industry in Alabama or elsewhere in the country. Construction companies that have remote job-sites will benefit from having an easy method to transfer information to and from the main office. Using InfoPath allows companies to create a form and deploy it throughout the organization and collect the data back into a database while maintaining the same view to the end users, in real time. This method is not astonishingly different from what various construction management software packages are able to do currently. However, collecting data using InfoPath is radically different in that it does not require a software company or a computer programmer to design this system anymore. This can be done by anyone who can use Microsoft Access and willing to learn InfoPath. Learning InfoPath would be relatively easy for someone familiar with Microsoft Access. The 'Wizards' and 'Menus' found in InfoPath are very similar to those

found in Microsoft Access. An example of how this would benefit a construction company would be keeping up with daily reports from various job-sites. Once an InfoPath form is designed and deployed, the superintendents or project managers will only have to enter the information and press a button to transmit the information back to the home office… and do this without having to pay for expensive computer programs or computer programmers. A company merely has to use Microsoft Office to achieve this. Once trained, personnel in these three construction companies would use InfoPath to gather data from remote locations in the future.

Conclusions

The construction industry has relied for too long on expensive software packages or on hiring programmers at an expensive price. Microsoft Office is a very popular software package in the construction industry. InfoPath is the latest addition to the Microsoft Office Suite. This program allows us to gather data without expensive software packages and by using something companies are already paying for, namely 'Microsoft Office'. This software is easy to learn and use.

Advances in the area of project management solutions such as web-based systems have helped companies reduce overall project durations allowing companies to be more profitable. However these solutions have also created some redundant activities.

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