IMPROVING CONSTRUCTION COMMUNICATION:
THE IMPACT OF THE ON-LINE TECHNOLOGY
Improving construction communication

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Abstract

The Special Projects Administration (SPA) of the Ministry of Public Work in the State of Kuwait is responsible for managing the construction of Kuwait's prestigious facilities that are, usually, complex and costly. This paper suggests a Web-Based Information Delivery Intranet Site as a complementary communication tool that would enhance the delivery and exchange of information on the SPA's construction projects. Also, the paper includes areas of improvements to the SPA's communication process as a result of incorporating the WWW technology in communication. Improvement on the information delivery time is found to be the most significant.

Keywords: communication, multimedia, WWW, information technology, on-line.

1   Introduction

It is hard to ignore the importance of the emerging technologies in leading the construction industry to a competitive edge. One such technology is the on-line multimedia technology that can add value to the communication process among the construction project's participants. Effective communication is essential for the functioning of any organization. Breakdowns in communication contribute to a group of problems that result in low work productivity and quality.

The impact of the Internet on the construction industry is seen in the area of "Open Collaboration" that transcends time zones, national and organizational boundaries and even language [Brides 97]. The move toward more collaborative working within the construction industry is a welcome one given the numerous problems that have resulted from the industry's fragmentation and adversarial posture [Anumba and Evbuomwan 96]. The combination of HTML (Hyper Text Markup Language) based Web pages with Java Applets, CGI (Common Gateway Interface) Scripts, Databases, FTP (File Transfer Protocol), peripheral devices, and new data formats creates an endless universe of possibilities for collaborative engineering [Rojas 96].

The A/E/C firms in Kuwait need collaborative working environment through continually developing and improving its communication processes to achieve project objectives. Minor improvements in communication become, even, more important in managing large and complex construction projects. One of the major agencies in Kuwait that needs to continually improve its communication process is the Special Projects Administration (SPA) of the Public Works Ministry.

This research suggests a supporting tool to the current communication process used in the SPA. The supporting tool is an on-line Information Delivery and Exchange Site that would complement the oral and written communication channels of the (SPA) and constitute a basic Intranet environment. A general evaluation of the Web technology, through browsing web pages of different web sites around the world, one can extract the preliminary benefits that the Web Wide Web (WWW) technology can add to the SPA's communication process. It could reduce cost by reducing printed papers usage, phone and FAX charges, manpower doing secretarial work (calling, printing, mailing, etc.), postage costs, and information processing time. Also, the SPA, as an agent for public projects, can have access, and vice versa, to large international contractors and qualified bidders through WWW technology.

2   Background

The SPA manages large and prestige public construction projects; and therefore, little savings in time and/or cost, as a result of improved communication efficiency, can add up to be potential toward the end of the project. Examples of recent projects under this administration include the Amiri Diwan and the Kuwait University projects with total cost of KD 150 million and KD 220 million respectively.

The SPA's main communication processes consist of three types: face-to-face meeting, telephone, and written communications. Written communication is the most formal in the SPA because it provides hard copies for storage and retrieval in case documented evidence is needed in the future. SPA's written communication channels, mainly, include letters and memorandums. Letters in the SPA, are used through out the project life cycle to document action, convey information, give instructions, and monitor work progress; whereas memorandums, short written forms and less formal then letters, are often used for documentation of communication or as a record action (SPA Reference Manual 1997).

While lines of authority are well defined in the SPA which makes communication easier, the administration is moving slowly in exploring new means to improve the communication efficiency and result in better productivity. New and advanced means of communication channels include: electronic mail, video conference, computer software (e.g., integrated databases), voice mailing, and the on-line WWW technology. There are many barriers to accepting and implementing new technologies in the SPA, one of which is the assumption that such technologies have high price tap, including the cost of training, for its benefits. Proving, to the SPA's decision makers, that such barriers are no longer so and that a lot of benefits can be gained from utilizing advanced technologies in communication would be an important step in the way of developing a technology strategy for the Kuwaiti construction industry.

3   Objectives

This research implements and evaluates a new medium of communication as a means of improving the effectiveness of communication in the SPA. That new medium is a WWW based, and is best described as a Web-Site or a Web-Page. WWW is, basically, a scheme for using the electronic Internet to exchange information in hypermedia formats which is achieved through a web site or location that acts as its server.

This paper presents a Web-Based Information Delivery Site as a complementary communication tool that would enhance the delivery and exchange of information on the SPA's construction projects. Also, the paper includes areas of improvements to the SPA's communication process as a result of incorporating the WWW technology in communication. The www technology is a valid experimental area because it has not been tested before in the SPA, it is a current issue in Kuwait, and it holds a lot of promises.

4   Communication channels and facilities

The electronic communication that has been implemented includes all types of communication necessary between the SPA and other main parties during all project stages. In the pre-design stage, the main parties are the owner, end user, Ministry of Planning, Audit Bureau, and Kuwait Municipality. In the design stage, two more parties (design consultants and MPW administrators) join the communication channels. In the tendering stage, two additional parties (the Central Tendering Committee and general contractor) join the team. In the construction stage, the supervision consultant joins the team.

The communication between the SPA and other project parties is extensive especially with the design consultant and the contractor. Generally, the A/E maintains open communication channel with SPA at all times. The contractor, on the other hand, has numerous obligations towards the SPA including:

- Temporary & mobilization works
- Daily construction reports
- Submittals and transmittals
- Project schedule approval and updates
- Material/equipment permit
- Request for subcontractor approval
- Progress meetings
- Payment certificates
- Provisional sum release order
- Variation order
- Substantial completion form
- Final completion certificate

The SPA Web media includes all project documents, especially the plans and specifications of projects. Communication facilities in a given project include memos, letters, and reports. Project reports are the main formal means by which project progress is communicated and recorded. As records, they are vital parts of the projects audit trail, so they must be prepared with all possible care. Project reports should:

- State clearly the current status of the project
- Compare actual achievements with planned target achievements
- Draw attention to critical issues

- Identify problems and propose solutions
- Promote effective management and control

Project reports should preferably be based on 'exception' reporting, i.e., highlighting variations from the plan. This helps the reports to be concise and forward looking. Effective management and control needs timely action, so project reports must be produced regularly and promptly. It is usually better to have roughly accurate information quickly than to have precisely accurate information late. Consequently, posting project reports on the SPA-Web site is the fastest distribution method.

The main implementation reports are: a) progress reports, b) cost reports, c) earned value reports, and d) debrief reports [Kartam 99]. The latter type of reports provides the means of learning how to improve the management of future projects. By inputting such reports on the SPA-Web site, management at all levels can get advantage of Internet-based communication in receiving and commenting on project progress. This real-time communication provides an excellent opportunity for brain storming and overcoming difficulties in a proactive, rather than reactive, planning and control manner.

5   SPA web site

Decreasing project life cycle and increasing cost of capital are compressing the time needed to design and construct complicated facilities within the SPA. At the same time, increasing technological complexity is shifting project control away from prime contractors towards specialized subcontractors. This is a trend, which suggests that the project management industry needs to consider the reengineering of how it processes and moves information among all concerned parties.

The SPA-Web site has given a new tool for reengineering the delivery of information on construction projects. This Internet-based tool allows geographically separated teams easy access to project specific information and documents, thereby streamlining traditional information flow. In an age of increasing complexity, such basic project Intranet can enhance communication and improve teamwork in the execution of rapidly developing construction projects.

As information changes, the server content can be easily updated with new or revised data. This flexible approach means that geographically remote project teams can access timely, consistent and accurate information without expensive typesetting, printing, distribution an mailing charges. The basic Intranet uses

information that does not change rapidly. This simplifies administration and publication and acts as the stepping stone for a larger Intranet system.

In the SPA, this Internet-based tool has shown promise as a cost-effective way to improve the delivery of information. Thus, it improves teamwork, streamlines project schedules and reduces litigation with the end result of providing the customer with increased project satisfaction.

6   Information security

Because of the contractual nature of the construction business, many firms are afraid of losing control of the information they have developed. Fortunately, the open standards of Internet-based systems offer several ways to move and manipulate information.   For example, a superintendent can use the browser to view the design files in a "read only" mode. Web-based applications such as Adobe's PDF format enable developers to publish documents that look just like the printed page. Similar to paper blueprints, this enables the user to look at the drawings and retrieve information, while leaving the control of the file with the original publisher. Given the increasing popularity of the Internet, most software applications are now being developed for Web publishing.

Webmasters can also set up servers to control access to specific parts of an Intranet.   SPA-Web media is set up to allow public access to the project description and progress information, while restricting access to more sensitive parts of the web site. The project team has set up a matrix of access privileges to the project information.

7   Benefits

In a distributed questionnaire to all individuals using the SPA-Web media, many benfits have been reported including:

- Improve information accuracy and accessibility
- Enhance communications and teamwork between disparate teams
- Eliminate redundant files
- Eliminate multiple data entry tasks
- Provide multi-locations access to information
- Eliminate departmental and organizational ownership of information

- Improve process efficiency since communication uses less time & fewer resources
- Improve customer/ supplier relations
- Reduce dependency on paper based information
- Obtain accurate and timely reporting

8   Findings and conclusions

Good communication is critical in achieving better cooperation and coordination across organizations in the business world. In construction the project team consisting of the owner, contractors, designers, and other parties all need to work together to achieve common goals. The project team needs to communicate over the life cycle of the project efficiently (i.e., with minimum time and resources) and effectively (i.e., different parties receive same interpretation).

Using the SPA-Web media, the communication efficiency between the SPA and the A/E and the contractors is improved significantly with a reported time saving of more than 80%. In addition, the communication effectiveness is improved by minmizing any misunderstanding or misinterpretation by the different parties. The SPA-Web media also reduced the indirect cost by saving paper usage, phone and fax charge, postal cost and information processing time. Perhaps, most important result is the reduction of claims resulting from delay in receiving information and misinterpretation.   This new media speeds up information delivery, improves information accuracy and contributes to the total value management of construction projects.

9   Acknowledgement

10   References

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