Chapter 7
Current and Emerging IT Tools and Applications

ABSTRACT

This chapter begins by rationalizing the need for the construction industry to embrace new technologies for information management and documentation. The perspectives are taken from within an organization and a project whereby stakeholders from different organizations are involved. The aim of better information management is to allow the adoption of collaborative working practices, which can bring about the possibility of information to be shared among staff of an organization and between project teams that exist across organizational boundaries. Next, in laying down the foundation for the current and emerging IT tools, their basic information and technical details are presented. This is followed by a review of their applications, particularly those that relate to the construction industry. The applications of Electronic Document Management Systems (EDMS) are reviewed and then systems for Enterprise Resource Planning (ERP). The types of information that are exchanged between different construction project parties within a project are described, including the flow of data. The benefits of using EDMS and ERP systems for project management and supply chain management, respectively, are discussed. The main issues and problems that companies face when using such technologies are also discussed. Besides EDMS, another commonly adopted tool for collaboration is the project extranet. On applications of this tool, the main features and functions are presented, covering also the potential benefits of applying extranets to construction projects. Moving to specific areas of applications like design, construction planning and execution, resource procurement and facility management, the current tools that enable visualization, virtualization, mobility, and sensing are described. Emphasis is placed on the methods of application for each area to highlight how technology can aid in improving work processes and outcomes. The chapter concludes with a summary of the main points covered on current and emerging construction industry IT tools and applications.

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NEW TECHNOLOGIES FOR INFORMATION MANAGEMENT

The need for information in general reflects that organizations are open systems, interacting with their environment (Boddy, Boonstra and Kennedy, 2008). As inputs, organizations draw resources from the external environment and transform them into outputs before passing them back to the environment. Clearly, applying computer-based information systems can significantly lower the cost of processing data and information, and linking computers with telecommunication systems makes it even faster and cheaper to exchange information with little concern about distance. In essence, the flow of information has to be supported by technology infrastructures to facilitate activities between individuals, within an organization, between organizations or between organizations and individuals. Such IT infrastructures that can support the flows of information between individuals or organizations, within an organization and between individuals and organizations would have to have computer hardware, computer software, data management technology, networking and telecommunications technology, and technology services as components (Laudon and Laudon, 2007). They can serve a range of purposes like operational, monitoring, decision support and communication. They can function as individual systems, departmental systems, company-wide systems, inter-organizational systems or even community systems like the social network sites.

The requirements and complexity of information management increase in the construction industry. The large volume and diversity of information used and exchanged among professionals with different backgrounds require the use of IT tools which are peculiar to construction. Each construction project has information needs which are different from other projects of a similar nature. In the traditional practice, most of the information related to one project is lost, and new information has to be generated for each new project. The lost information would have been useful for subsequent maintenance (or facility management) and even refurbishment. Over the last few decades, IT has tried to permeate every aspect of construction but, because of a lack of integration, IT applications are mainly isolated. It is used to tackle individual tasks, like drafting, quantity take-off, engineering analysis, cost estimating and others. This isolated situation of IT application can be attributed to the fragmented nature of the industry, mainly because each party to a project is driven by individual business goal. However, there is a growing demand for integrated information systems that allow different stakeholders of a project to share common knowledge and information. With growing awareness of the benefits of IT when it plays a role to integrate construction both vertically and horizontally, it is increasingly being recognized as a key enabler to integrate data, process and participants on a building project life cycle. The end result is a complete collaborative and integrated project life cycle that can achieve three objectives (Department of the Environment, 1995). They are to:

1. Encourage improved sharing of information through the use of integrated project databases;
2. Develop an industry-wide knowledge base that facilitates the sharing of information and promotes team 'syntegrity'; and
3. Use IT to improve basic project processes.

Based on the analysis of current working methods for information management, the recommendation is to adopt standardized IT systems as the way forward if documentation is to be controlled, structured and readily available to all construction professionals (Sommerville and Craig, 2006). In construction, applying IT to information management is likely to achieve coherent management and electronic sharing of information because it forces different parties to