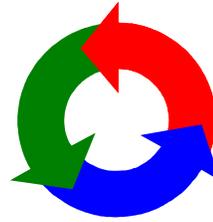


Article category: INTEGRATION

The role of INTEGRATED INFORMATION in project management



*Stephen Allen and Kosie Smith**

Integration of construction teams and project information leads to improvements in the construction delivery process. This article describes different levels of construction information integration. The starting point is a 'partnering' approach to project management. It then considers the integration of project information and the integration of construction processes.

Furthermore, the application of web-technologies to establish an environment or platform for project information integration, is briefly described in terms of the benefits and constraints of web-enablement. Lastly, an example is given of such an integrated project environment as developed by the Division of Building and Construction Technology (Council for Scientific and Industrial Research [CSIR]). This service-oriented web-enabled environment (IPROS – Integrated Project Services) provides a platform for single-project, multi-project and inter-company project information integration.

Process information, product information

Enormous amounts of information are generated for each building project by a variety of team members. However, sharing and exchange of project information is often inconsistent or information gets lost, is unnecessarily duplicated or available to only a few of the many participants in the project at a given time ⁽¹⁾.

The Internet and web-technologies introduced new paradigms for electronic information sharing and exchange. These paradigms include a shift from fragmented and disjointed information sets to the integration of project information in a single data source, which is accessed through the World Wide Web (WWW).

Construction project information can be broadly categorised into **process information**, ie information generated during a business or construction process, (eg activity or task scheduling, resource planning, budgeting, scheduling, etc.) and specific **product information** (eg architectural and structural design). The advantages and constraints of utilising the Internet and web-technologies to integrate project information and processes are briefly discussed in the next section followed by an example of an integrated project environment.

Partnering on construction projects

Partnering emphasises an integrated way of working between teams of committed project stakeholders who are seeking to provide the client with best value in terms of budget certainty, certainty of project delivery and finished project quality. Partnering can be described as an approach to construction that places emphasis upon continuity and the development of long-term, non-adversarial relationships between all project stakeholders. Research illustrates that partnering facilitates total quality and continuous improvement in project performance and productivity ^(2,3).

The fostering of positive relationships in the construction "team" improves communication and encourages innovation. This provides benefits to construction teams, as they are able to focus upon productive work. It also serves to improve the construction process resulting in the client receiving increased value for money. It is clear, therefore, that successful project management requires a co-operative and non-adversarial approach to business.

Operating in this way will help to develop a particular organisational, and maybe of increasing importance in today's world of construction project culture. Once this attitude is in place, there are certain things which can be done on both a project and an ongoing basis to address particular performance and performance improvement issues.

The linking of such a collaborative project management style with the enabling power that technology provides, creates the possibility of a fully integrated project environment and resultant improved project delivery.

The integrated project environment

An integrated approach to construction information and processes is sure to improve the construction delivery process by solving many of the problems caused by fragmentation. The fragmented nature of the construction delivery process further complicates information integration because each of the construction processes generates a host of disjointed information sets. Although the information sets clearly relate to each other (eg design and costing), there is no integration between these sources.

The scope of construction information integration spans from integrating industry information to integrating project information. Two methods or types of information integration that fall within this scope are described next, namely the industry wide knowledge base and the Integrated Project Database. The relationship between these two types falls outside the scope of this article ⁽⁴⁾.

It is important to note that neither of the two methods is currently available, but that they set the trends that greatly influence the attempts currently being made to improve construction information integration. It is therefore expected that, in the interim, a phased or stepwise approach will be followed whereby each step will bring the industry closer to the goal of full electronic integration of information and processes.

Industry-wide knowledge base

The industry-wide knowledge base is an Internet-enabled information and knowledge repository that can be used by all stakeholders in the construction industry, ranging from individuals to governments. All stakeholders, whether directly or indirectly related to the construction industry, at some stage need information that requires regular updating (eg cost, new products) and is most likely not to come from a single source.

The aim of an industry-wide knowledge base is to provide electronic access to information required by the construction industry through a single access point ⁽⁵⁾. Information required by industry includes information about products, stakeholders, standards and best practice.

From the above it is clear that due to the scope there can be no single information base or centre for all the relevant information. It is, however, feasible to implement the industry-wide knowledge base in a distributed model, ie data and applications are geographically distributed, but accessible through a single front-end (website).

Components of the industry-wide knowledge base are distributed data (warehouses of information) residing on application servers, the Internet and web-technologies (eg browser), a network of websites and a hosting service for access to the knowledge base.

The integrated project database

A single electronic project information core, in the form of a *shared project model*, integrates information required by the various construction disciplines. This electronic information core is often called the *integrated project database*. This allows the different professionals to still view the information they require in the format they prefer, but the information is now drawn from a single, integrated information base. No longer is duplication possible since there is only one information model per project. A shift of focus is apparent, namely from fragmented construction disciplines to integrated construction processes (See Figure 1).

International initiatives working together to achieve inter-operability and integration through a shared project model are **ISO 10303 STEP** (where STEP stands for Standard for the Exchange of Product Model Data) and the *International Alliance for Inter-operability (IAI)*⁽¹⁾. The latter has members from various sectors of the construction industry, software development companies and research institutions.

Current status of information integration

Information generated during the construction delivery process currently still consists of disjointed sets of data in the form of eg CAD drawings, spreadsheets, faxes, e-mails, etc. The challenge, as a first step towards improved information integration, is to establish a project information database consisting of all information generated during the project life cycle and to facilitate sharing and exchange thereof. This can easily be achieved through the use of the Internet- and web-enablement (See Figure 1).

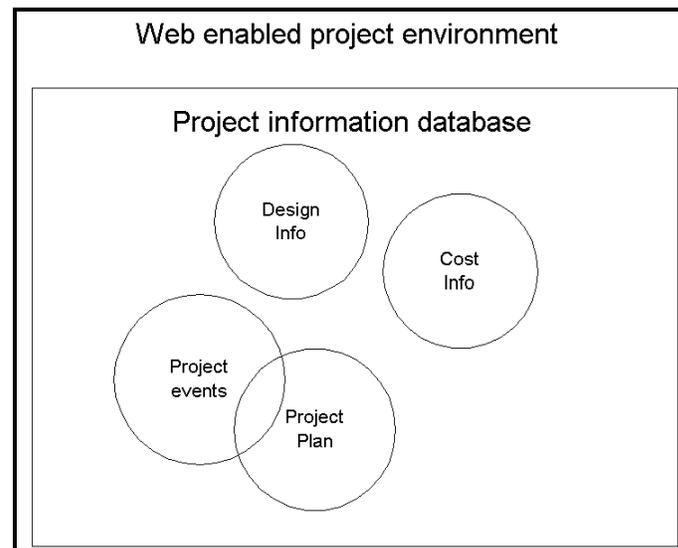


Figure 1: *Towards project information integration*

The above integration scenario is clearly not yet the optimal scenario, but the benefits derived from even these initial attempts call for serious consideration to implement for future construction projects. Consideration should include carefully weighing up the benefits against the areas of concern, as described next.

Benefits

The Internet serves as a backbone for virtual team working, where team members can work together although being geographically distributed. Information can be accessed, shared and exchanged when needed and irrespective of time or geographical location. Some international projects have already extended their workday to 24 hours by distributing the project team across different time zones. In a highly competitive global construction industry the Internet and web-technologies provide the infrastructure, tools and techniques required for international competitiveness.

Constraints

The paradigm shift towards electronic information sharing and exchange is still constrained by a lack of or insufficient infrastructure, eg slow response time due to speed limitations on the Internet. Coupled with the fact that the construction industry is perceived to be conservative compared to other industries, the initial steps towards information integration through web-technologies are therefore expected to face resistance from some industry sectors.

However, the Internet is about business and not only for browsing a bottomless pit of content. A culture change is essential for successful integration of construction information using web-technologies.

Other constraints include computer illiteracy, resistance to change and potentially high cost of establishing and maintaining a web-based integrated project environment.

Considerations

Some considerations to take into account when establishing a web-enabled integrated project environment include:

- ❖ Can security be properly planned and implemented?
- ❖ Is the project's history recorded?
- ❖ Is the application flexible? (ie equally suited for a single project and multiple projects or for individuals and bigger, established companies)
- ❖ What would the initial investments and operational costs be?

IPROS (Integrated Project Services)

IPROS is a web-enabled platform for project information sharing and exchange, e.g. documents, events, activities, etc. It is a service-oriented platform developed and hosted by the Division of Building and Construction Technology, CSIR, Pretoria.

It runs on a thin client-layer (the user only needs access to the Internet and a web-browser). All processing is done centrally on the server using Active Server Pages (ASP scripts).

Some of the features and services provided are:

- ❖ Structured e-mail – e-mail messages are automatically being generated by the system and sent to relevant team members whenever an action is performed, e.g. document edited or activity scheduled.
- ❖ Security profiling – the system allows for the creation of security profiles for each work group. Team members can then be allocated to one or more work group, ensuring a flexible and secure project environment.
- ❖ Project events (diary) – significant project events can be posted and viewed from the project events (like meetings and milestones) component.
- ❖ Activity scheduling – activities or tasks can be scheduled for team members, who can in turn respond to incoming activities by accepting or cancelling the activity.
- ❖ Electronic document management – the document management component enables seamless electronic information distribution and sharing in a secure (protected) environment. This service includes registration of document types, storing and retrieval of project documents, version control on documents that have been edited and recording the usage history of documents (eg who edited a document and when).
- ❖ Data hosting – project information is located on a server. The service provider is responsible for regular backing up all information as agreed upon.
- ❖ Project history – the version control feature built into the electronic document management system and the recording of actions performed on a document or activity provides useful information of a project's history.
- ❖ Generic nature – IPROS is independent of the nature of the project environment. It can therefore be a platform for a single project or for multiple projects. It is also independent of the software used by the project team, since it only acts as a data hosting service, which only requires access to the Internet and a browser.

Individuals and SMMEs can benefit from such a generic platform because of the wide scope of services and features it provides. Bigger, established companies, on the other hand, can greatly benefit from a selection of the components and features for projects where team members span several companies, in which case established infrastructures (eg Intranets) are incompatible or restricted for internal use only.

First steps

The Construction Industry is taking the first steps towards electronic integration of information. These steps mainly focus on bringing project information together in a single integrated electronic environment, supporting a partnering approach to project management. Although the information sets generated during the project life cycle will for some time to come still be disjoint (eg planning information not integrated with design drawings, etc.), integration is achieved at a higher level, namely through an integrated project environment. The Internet and web-technologies made these first steps feasible on a global level.

Although resistance is expected due to constraints such as speed, lack of infrastructure and imperfect initial attempts at integrating project information, it is foreseen that information and process integration will gain momentum towards the integration of all construction project information into a single project database.

IPROS (Integrated Project Services) is a Web-enabled platform for the provision of services or tools to perform generic project tasks, such as activity scheduling and electronic document management. Furthermore it allows for the establishment of security profiles on work groups. As progress is made towards industry information integration through an industry wide knowledge base and the development of construction product and process models, the disjointed information sets currently populating the integrated project environment is expected to be replaced by a single data source, or integrated project database.

Human and technological aspects of project management need to be co-ordinated if project performance improvement is to become a reality. Technology already exists to support the quest for more effective project-based communications and by bringing together the human side of business with hard, hands-on technology, the future may be closer than we realise.

** Stephen Allen and Kosie Smith are with the CSIR. They presented this article at a PMISA (Project Management Institute South Africa) Regional Conference held in Durban in 1999.*

REFERENCE

1. International Alliance for Interoperability. [Online]. Available: <http://www.iaieweb.lbl.gov>
2. Bennett, J & Jayes, S (1995), *Trusting the Team*. Centre for Strategic Studies in Construction, The University of Reading, UK. ISBN 0-7049-0503-5.
3. Bennett, J & Jayes, S (1998), *The Seven Pillars of Partnering: A guide to Second Generation Partnering*. Thomas Telford Publishing, London, UK. ISBN 0-7277-2690-0.
4. Smith, K Construction Information Technology: A Strategy for Global Competitiveness, 1999, CSIR Internal Report
5. Newnham, L and Amor, R Translation of Manufacturer's Product Data for the ARROW Product Search System. Proceedings, ECPPM '98 Conference on Product and Process Modelling in the Building Industry, Watford, 1998, pp 405-411.

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