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Case Study

WEB-BASED COLLABORATION TOOLS FOR THE CONSTRUCTION INDUSTRY: THE JOHN HOLLAND EXPERIENCE

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ABSTRACT

John Holland and other companies in the construction industry are in the early phases of implementing Web-based collaboration tools across their businesses. John Holland has taken the decision, along with a group of 5 other major contractors, to commit to using Optus inCITE. Optus inCITE is a neutral construction industry trading exchange that is available to the construction industry as a whole, and which comprises the three applications that are grouped under a single portal. Those applications are:

- Purchasing – an on-line purchasing system
- Tender Management – e-tendering and subcontract management
- Document Management – on-line management of documents and communication

This paper looks at John Holland's experiences in implementing Optus inCITE applications in its businesses.

Keywords : **Web-based, Collaboration, Documents, Tendering, Purchasing, inCITE**

1. INTRODUCTION

John Holland is committed to develop the appropriate use of Optus inCITE applications throughout its businesses and to promote Optus inCITE in the construction industry as a whole. It is therefore Optus inCITE which has been, and will continue to be, the main focus of our exploration and implementation of Web-based collaboration tools.

All the same, many of the features of Optus inCITE applications and the issues relating to their implementation will be in common with other Web-based collaboration tools.

1.1 BACKGROUND TO OPTUS INCITE

The concept behind Optus inCITE was developed by CITE Australia Pty Ltd (CITE). CITE was formed by a group of seven major contractors who came together with the specific purpose of establishing an on-line trading exchange for the construction industry. The seven contractors were Barclay Mowlem, Baulderstone Hornibrook, John Holland, Leighton Contractors, Thiess, Walter Construction and Transfield (the construction businesses of Transfield were later acquired by John Holland). The concept was for neutral trading exchange which would cater for the construction industry as a whole; accessed through a single Web-based portal. It was intended that the trading exchange would provide services such as on-line applications for communication, document management, procurement, industry publications, discussion forums, project and tender opportunities, and company information; all of which could be customised by the users depending on their requirements.

After a lengthy process of requesting proposals, analysing proposals and negotiating the details, CITE signed an agreement with Optus in October 2002, and Optus inCITE went into development. Under the agreement Optus committed to develop, own and operate the trading exchange; to market it to all sectors and participants in the industry, to provide training and support, and to continue development of the exchange to meet developing industry needs. For their part, the CITE companies agreed to sign off on and test the software, participate in marketing programmes, assist with further development of the exchange, promote internal use of the system, and encourage wider use to other sectors of the construction industry, with the intention that Optus inCITE should become an industry standard.

Optus inCITE came on-line in May 2003 bringing together three initial applications within one portal, and they are available to the Australian construction industry on a pay-for-use basis.

1.2 THE APPLICATIONS

The initial applications selected for incorporation into Optus inCITE were Tender Management, from EU Supply of Sweden; Purchasing, from Conexa of New Zealand; and Document Management, from AEC Communications of Germany. These applications are accessed through a Web portal designed exclusively for Optus by Hothouse of Australia.

1.2.1 The Portal

The Web portal is the single point for access, registration and administration for the trading exchange. Once logged onto the portal, users can see the various applications for which they are registered and can readily move between them.

1.2.2 Purchasing

The purchasing application (Purchasing) is an on-line system for both buyers and suppliers. It provides catalogue-based purchasing, issuing and receiving of requests for quotation, purchase order management and invoice matching.

The application can be customised to reflect the workflows or approval process of each company or business unit. Whilst a single set of catalogues may be used for a particular supplier, each purchasing company can maintain their own price list and terms. This allows each company to negotiate national and regional agreements with suppliers, and to make those agreements automatically available to all the purchasers of that company.

1.2.3 Tender Management

The tender management application (Tender Management) covers both estimating and procurement phases of a project. Drawings and documents, electronic bills, and electronic question and answer forms are distributed to invited responders (contractors, subcontractors and suppliers) through the portal. These responders then indicate their interest to quote, compile their quotations and responses, and submit their quotations directly through the portal. When the quotations are returned, these can be analysed, compared and approved. The packages can then be let on-line or included in a tender. The system can be configured to follow required authorisation processes and it maintains a clear auditable trail of all transactions.

During the estimating phase (or pre-award) of a project, Tender Management is an e-tendering application by which tender documents are distributed to invited tenderers who then submit their tender on-line. It is multi-tiered in that it allows main contractors to receive tender invitations and documents from a client and then to break this information up into packages for quotation by subcontractors or suppliers. This information can be pushed down to further levels in the supply chain. As quotations are received, the main contractor can analyse and evaluate these within the application and include the appropriate prices and details in the final submission to the client, or the subcontract package to be let.

As a procurement (or post-award) application Tender Management generates invitations to subcontractors and suppliers to quote for discrete packages of work which, once returned, are analysed and awarded to successful bidders. Tender Management also incorporates a contract management module with which a commercial team can continue to manage the subcontract or supply agreements through the construction process.

Tender Management provides for tight version control with all parties looking at the same documents or sub-set of documents in the portal. When addenda are issued to the main contractor and the relevant documents are replaced on the system, the system will identify those subcontract packages that included documents which have been amended. Notifications of revised documents (addenda) can then be sent automatically, and acknowledged by the recipient. The entire process can be monitored and traced.

1.2.4 Document Management

The document management application (Document Management) provides on-line management of documents and drawings, and any required types of formal or informal communication. It supports collaboration by managing the workflows between clients, consultants, contractors, subcontractors and any other stakeholders in a project.

The application is fully configurable to suit project management procedures, approval and verification processes, and distribution and access rights (security). It is a fully collaborative system, in which each individual participant has their own identity, responsibilities and access rights in accordance with their role in the project and the company under which they are registered. Users only see documents or document types that are applicable to them as defined by the configuration, in other words, those for which they have been included in the distribution or given access rights.

All the data are stored and secured and in a single, third-party data warehouse which is owned and operated by Optus. This is a Government A1 accredited site.

Document Management provides for full traceability, identifying documents that have been received and opened, and providing a detailed reference of the document process (document history). It also provides strict version control of documents. Given the configurability of the system and its ready accessibility from any location, it is particularly powerful for use in joint ventures, alliances and projects involving a collaborative design and construction.

2. JOHN HOLLAND'S USE OF WEB-BASED COLLABORATION TOOLS

Whilst our initial focus has been on implementation of Document Management, John Holland intends to develop the use of all three Optus inCITE applications.

Figure 1 below illustrates the fit for the three applications and their various uses across the life-cycle of a construction project.

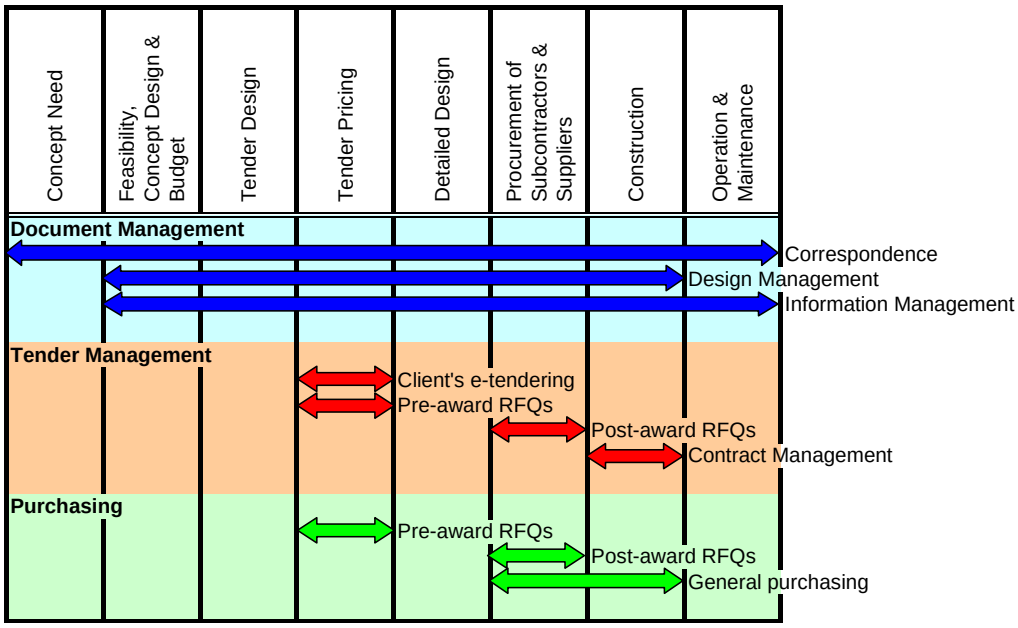

Figure 1 – inCITE Application Fit to Project Life-cycle

2.1 PURCHASING

John Holland's involvement with Purchasing has been limited to date. Supplier adoption meetings have been conducted with major suppliers of John Holland and the other CITE companies, but up-take has been slow. The main reason for this is a "chicken and egg" situation where suppliers are reluctant to come on board until the major contractors are using the system; and major contractors will not commit until the suppliers are trading. However, CITE Australia is committed to developing the use of Purchasing, and the uptake of the system is gaining momentum. Two of the CITE companies have already developed an interface with their back office applications.

There are also cultural barriers that are hindering the implementation of the purchasing system. Potential users perceive that there will be a loss of face-to-face negotiation between supplier and contractor, and that they will have reduced involvement in the selection of preferred suppliers for a project. However, using the application does not affect the way in which deals and agreements are negotiated, and there is no reason why projects should not play a key role in selecting their suppliers, as they do under existing systems.

Some site personnel are not comfortable with using an electronic on-line system for purchasing, or they feel they are too busy to raise orders through the system and would prefer to use the phone or fax. Raising orders through the application at point of purchase saves administration time as well as providing project management with accurate cost commitments. However, the system does not preclude site staff from using the phone or fax to place orders as long as this meets with the approval of project management, and someone is given the task of raising the necessary purchase order number on their behalf.

John Holland is preparing to commence pilot use of the system at selected offices and sites in the near future.

2.1.1 Purchasing: Summary of Findings

Purchasing provides a platform that ensures site staff are placing orders with pre-qualified and approved suppliers, using project or company negotiated prices and terms, adhering to formal approval cycles, controlling receipt of goods and keeping an accurate and up-to-date record of commitments. Purchasing will streamline order and invoice processing across all purchasers and suppliers, and will reduce errors and time spent with administration as the application can be integrated into back office systems.

2.2 TENDER MANAGEMENT

John Holland has started using Tender Management in both pre and post-award phases of a project for issuing tender invitations, asking pre-qualification questions, and distributing documents and addenda. At this stage the system has not been used by a client to issue a tender to main contractors, however, the Roads and Traffic Authority (RTA) of NSW is intending to run a pilot tender in the near future.

2.2.1 Use of Tender Management in the Estimating Phase (Pre-Award)

There is a common belief that many subcontractors and suppliers will not use collaborative Web-based tools because they are not technologically able. Moreover, many estimators believe that during the tender phase we are not in a position to demand responses to requests for quotation on-line, or in a prescribed format – that we need the best offer irrespective of the way in which it is submitted.

There is evidence, however, that subcontractors and suppliers are not as technologically backward as the industry perceives. A research paper by Brad Marriott, from John Holland's Newcastle office, aimed to understand the level of acceptance and utilisation of information and communication technology by subcontractors and suppliers.

Brad Marriott sent out a survey questionnaire to 180 businesses supplying goods or services to the construction industry in the Hunter region of NSW. He received 111 completed responses and discovered that of the respondents:

- 95.5% had access to or used a computers at work;
- 89.6% used a computer at least once a day;
- 94.3% had internet access at work; and
- 89% considered their level of computer experience was at general level or higher

(Marriot, 2004).

John Holland's NSW/ACT branch has run eight tenders in the estimating phase using Tender Management. They have taken a conservative approach

by focussing on the industries involved in the supply and installation of building services (lifts, fire, hydraulic, electrical and mechanical services). It appears there is a greater acceptance for Web-based collaboration amongst this group.

The experience of using Tender Management in this way has been positive. The building services manager from NSW/ACT branch is very supportive of the application and intends to continue to use it on all suitable tenders. The benefits he has noted include:

- immediate notification when someone agrees to tender;
- fast distribution of documents; and
- quick and reliable management of addenda or changes.

Tender Management enables the tender team to separate the particular documents required to tender from those documents which supply additional information. This has meant that subcontractors are not wading through volumes of paper to find what is required. However, if a subcontractor wants to access more information it is readily available.

We have found that some subcontractors have problems downloading and printing the tender documents from the system, often due to their limited printing capability. There has recently been functionality added to the system that allows the subcontractors to simply choose a print bureau, select the documents they want printed, and produce a print order on-line. They will then receive hardcopy of the documents they want.

Another area where Tender Management has been deployed in the estimating phase is with Defence Maintenance Management (DMM), a joint venture between John Holland and Multiplex. In this instance Tender Management was firstly used to issue prequalification questions to gauge which packages subcontractors were interested in. This prequalification method was used as a way of getting the subcontractors registered and familiar with the system before the invitations to tender were issued. Out of 54 subcontractors 44 answered the prequalification successfully on-line.

Based on the subcontractor's response to the prequalification, packages were then issued in the same manner. Of the 64 subcontractors who accepted packages to tender, 25 used the entire process by submitting an electronic quotation. In the case where the subcontractors chose to submit quotations by other means, they still needed to use the system review documents and bills of quantities. The remaining 37 preferred to stick with the traditional method of submission.

The Tables 1 and 2 below summarise the on-line activity for the DMM tender:

Table 1: Response to Invitation to Prequalify

Description	Number of invitations	Accepted	Declined	Answered Questions On-line
Prequalification Questionnaire	54	47	0	44

Table 2: Response to Requests for Quotation

Description	Number of invitations	Accepted	Declined	Quotation Submitted On-line
Package A	26	18	0	3
Package B	15	11	0	5
Package C	19	13	0	4
Package D	5	1	1	0
Package E	6	4	0	2
Package F	11	4	0	2
Package G	21	13	1	9
TOTAL	**103**	**64**	**2**	**25**

This tender was in the rural area of the Riverina/Murray Valley in NSW, and indicates that, in this area at least, subcontractors do have the means to use the internet for business. One subcontractor indicated that DMM appeared more professional and organised than the other contractors by using on-line tools; that the information was presented in a clear format and was easy to find. The DMM team saved time by centralising their administration and the system gave them tight control over the process. The system kept them up-to-date with a subcontractor's progress and every transaction was fully traceable.

2.2.2 Use of Tender Management in the Procurement Phase (Post-Award)

DMM has also run a pilot using Tender Management in the procurement phase. All subcontractors used the system to accept the invitation to tender and to collect their documents. The Project Manager recorded his and the subcontractors' experience in a report which was generally positive.

All the subcontractors believed the system was beneficial to them. One subcontractor in particular noted that its team had increased confidence that they were working off controlled documents, that time was saved in not having to prepare multiple hardcopies, and that they could deliver responses back to the Contractor with ease.
(Young, 2003)

2.2.3 Tender Management: Summary of Findings

The immediate strength of this application is for efficient distribution and control of documents and addenda. As the industry becomes more familiar with collaborative tendering, the capabilities of the application can be more fully utilised, and the added benefits will be:

- receipt of quotations in a consistent format;

- efficient analysis and comparison of quotations within the application;
- direct transfer of selected prices and details to the main tender or subcontract documents.

Time is always of the essence to a contractor during a tender, and time saved by more efficient receipt and distribution of tender documents, and analysis of quotations can be utilised for engineering, innovation and other refinement of the tender to the client.

2.3. DOCUMENT MANAGEMENT

As mentioned above. the majority of John Holland's effort to date with the inCITE applications has been directed towards Document Management.

There has been cultural resistance to using a structured, on-line tool such as Document Management. We believe that this is largely due to current proliferation of unstructured e-mail communication, and unfamiliarity with a truly electronic system. Users need to be made aware of the importance of competently capturing and recording project communication, and trained to understand the concept of the system as well as how to operate it.

In General, the collaborative features of the system have been accepted quickly as all stakeholders in a project can readily appreciate the benefit of communicating and sharing documents on the same platform, and being able to access the system in real time from any location.

John Holland has used Document Management in a variety of situations; for tendering, and on active projects in joint ventures, alliances and on our own.

2.3.1 Use of Document Management on Projects

A joint venture of Thiess and John Holland (TJH) is responsible for the design and construction of the Lane Cove Tunnel (LCT) project. That project has employed full use of the Document Management features. It controls all project communication, design, reference materials, procedures, construction documents, human resources and community issues.

An area where the power of on-line collaboration is particularly obvious is in the design review process. The Document Management application has been configured to manage design distribution and approval processes that involve the consultant, the main contractor, the client's reviewers and the independent verifier. All of these parties are registered to use Document Management and complete all their required actions on line.

The collaborative design review process is based on a combination of a document status and a document naming convention. A document's status is similar to an approval cycle in that it determines the documents progress through the process and can only be changed by authorised stakeholders. For example, only the Independent Verifier can change the status of a document to "Verified".

The file naming convention clearly identifies the design document and its version. All Design Consultants on LCT must upload their design lots through inCITE according to this convention. The file name must include codes for document originator, document type, location, design element, document number, revision and version. For example, the file name: PB-SP-TU-DT00-0058-A-1.pdf indicates the originator is “Parsons Brinckerhoff”, the document type is “Specification”, the location is “Tunnel”, the design element is “Driven Tunnel (General)”, the document number is “0058”, the revision is “A” and the version is “1”.

The reason for this combination of naming convention and status is so the system can organise and automatically distribute the documents through the approval cycle, and also populate the key attributes of the document without the need for manual registration.

When the files are uploaded and assigned a status, the system follows preconfigured rules which dictate to who the document should be distributed, and consequently who has access. Design Consultants can only upload files named as indicated above and with a “For TJH Review” status. For example: if the status is “For TJH Review”; if the originator is Parsons Brinckerhoff; if the design element is Driven Tunnel (General); then distribute to the following Thiess John Holland (TJH) personnel. When TJH members are have finished reviewing the document, they too change the status to progress the design along for revision or acceptance. Once again the distribution rules take into account the file name and the status to determine the document’s route. This predefined workflow continues around to all the stakeholders until the design is verified and hence approved for construction.

Figure 2 below illustrates this flow around the concerned parties:

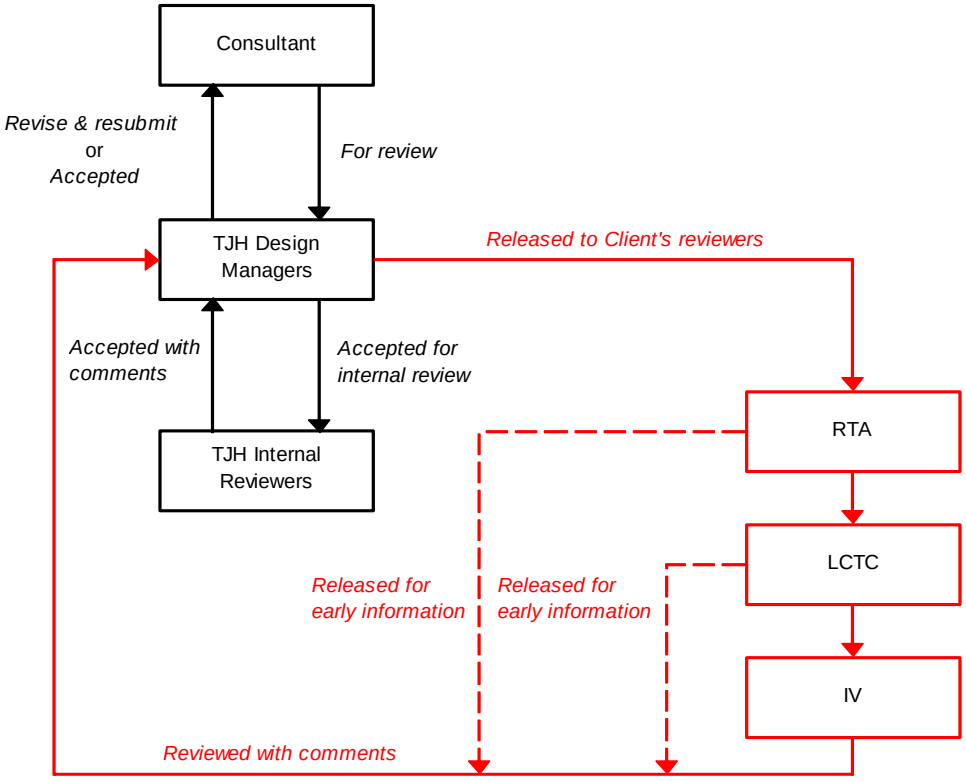

Figure 2: LCT Project Design Review Process

This design process works well in Document Management as people can only see a document when it has achieved a designated status, and they are always viewing the latest version as this only version listed in Document Management (previous versions are maintained in the history). What's more, the system maintains only one copy of each document (or document version) in a central database, so all those who access the system are viewing the same information. This is a very different concept from using e-mail to distribute documents. When a document is e-mailed to ten recipients, ten copies of that file are created, and each recipient must then organise it in such a way as to ensure they always refer to the most recent version.

It is important to note that document in this system can not be altered except if it is uploaded as a new version, in which case it will again enter the distribution and approval process. No document on the system can be deleted and the system maintains a full history and auditable trail of the design process.

We have used similar principles to those described above to configure many other processes on the LCT project so that they are structured, efficient and traceable.

2.3.1 Use of Document Management in Tenders

An example of Document Management for tendering is its use by Gold Coast Water to manage two competitive alliances (a short-listed tender process to select an alliance partner). John Holland was one of the two proponents on each of the competitive alliances, and assisted Gold Coast Water to configure Document Management to meet their rather special requirements. The system had to be set up so that two proponents could communicate with the client, but they could not see each other, and this was subject to close scrutiny by a probity advisor. The benefit for Gold Coast Water was the ability to efficiently control the method and format of document issue, review and endorsement, because the system's set up was identical for each proponent. The benefit for the proponents was the ability to communicate among their own teams in a secure environment and then forward documents directly to client in the prescribed format and manner without any unnecessary reformatting or administration. The benefit overall was that it ensured all were accessing the latest copies of the correct documents, and a complete audit trail was maintained between each proponent and Gold Coast Water.

Once a preferred proponent is selected, the same platform will be used for the project, with the unsuccessful proponent's information being archived off. We believe that Gold Coast Water are intending to use the system for more such tenders and projects in the future.

DMM have also used Document Management during the tender phase to manage correspondence between contributing parties, and the process of drafting reviewing and approving the extensive documents required to be submitted for a Defence maintenance contract tender.

2.3.1 Document Management: Summary of Findings

At the time of writing, John Holland had eight live Document Management projects. Interest in Web-based document management is growing through the company as more hear about the technology and its success, and we surmount the cultural barriers. John Holland's intention is to establish a series of standard configurations that suit various project types and disciplines in John Holland's businesses. Initially our we are targeting projects that have a collaborative element, such as design and construct projects, joint ventures and alliances, as Document Management can most readily add value to these projects. On each project we conduct a briefing and workshop to get buy-in from all the key stakeholders and to agree aspects of the configuration.

3. CONCLUSION

In John Holland we believe that Web-based collaboration tools are the way of the future and we are committed to implementing them across our businesses. These tools can provide efficiency and control in the way we communicate, share information and trade.

There are significant cultural barriers to be overcome, including technical inertia and loyalty to prevailing systems and practices, but there is already a growing momentum, and Web-based collaboration is rapidly gaining industry support.

Ultimately Web-based collaboration will alter the way we do business by changing the way we interface with clients, other stakeholders and the supply chain as a whole. It will provide strategic advantage through improved quality management, greater productivity, cost reduction and better interface with the all the project stakeholders.

4. REFERENCES

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