



2007

# Realising Electronic Tendering in the Irish Construction Industry

Alan V. Hore

*Dublin Institute of Technology*, alan.hore@dit.ie

Follow this and additional works at: <http://arrow.dit.ie/beschrecon>

 Part of the [Construction Engineering and Management Commons](#)

## Recommended Citation

Hore, A.V. and O'Connell, L., (2007), Realising Electronic Tendering in the Irish Construction Industry, CIB W092 Interdisciplinarity in Built Environment Procurement, Hunter Valley, Newcastle, Australia.

This Conference Paper is brought to you for free and open access by the School of Surveying and Construction Management at ARROW@DIT. It has been accepted for inclusion in Conference papers by an authorized administrator of ARROW@DIT. For more information, please contact yvonne.desmond@dit.ie, arrow.admin@dit.ie, brian.widdis@dit.ie.



This work is licensed under a [Creative Commons Attribution-NonCommercial-Share Alike 3.0 License](#)



## TWENTY FIVE

# Realising Electronic Tendering in the Irish Construction Industry

### ABSTRACT

The traditional tendering process that is undertaken within the Irish construction industry involves the creation and dissemination of many documents. Drawings, specifications and entire Bills of Quantities (BOQ's) have to be produced, copied, transferred and then returned in hard copy to ensure that all parties have the same complete information on the prospective project when pricing. The Irish Government Strategy for the implementation of electronic procurement (eprocurement), in the public sector, highlights that with an increase in the use of Information Communications Technology (ICT), cost savings, of up to 20%, are achievable through the use of Electronic Tendering (eTendering). The purpose of this paper is to support the contention that the current tendering process in construction is highly inefficient. The authors report on the outcomes of an observation study in early 2007 which identifies the main problems that exist within the current process in construction tendering in Ireland. The authors also present a status report on an industry-led network project currently being undertaken by the Construction Information Technology Alliance (CITA) in Ireland. This project aims to show how greater effectiveness and efficiency can be applied to the tendering process by the application of ICT already used widely in other industries. The project will specifically focus on the exchange of data between network members involved in the project by reaffirming the inefficiencies in current processes and by demonstrating the verifiable business benefits to be obtained through a live eTendering project.

**KEYWORDS:** Construction, Electronic, Ireland, Tendering

### 1.1 INTRODUCTION

Information and Communications Technology (ICT) tools are used today to support Architecture, Engineering, Construction and Facilities Management (AEC/FM) business processes. The information entering into these ICT tools, however is almost invariably passed from one ICT system to another by producing paper-based electronic documents, which in turn are re-entered into various other ICT systems along the AEC/FM life cycle (Froese, 2003). These inefficiencies cannot of course be attributed to one specific process or party within the industry. However, tendering is one area where significant cost savings can be attained, as acknowledged by the Irish government (DETE, 2006). It has been extensively reported by many authorities that collaborative exchange of data between construction project participants is not efficient (Thomas, 1999 and Gunnigan et al., 2004) and that sensible use of ICT enhances productivity. This paper will aim to outline the tendering process as it operates today in Ireland, the inefficiencies with the traditional tendering communication process and how the Construction Information Technology Alliance (CITA) are, by means of an industry-led pilot project (CITAX), taking a leading role in enabling the Irish construction industry to harness the greater efficiencies to be had through deployment of ICT.

## 1.2 BACKGROUND

Runeson and Skitmore (1997) depicted tendering as the process that connects the buyer to the marketplace firms. Hore et al. (1997) expanded this by defining tendering as “a procedure to select a suitable contractor, at a time appropriate to the circumstances, and obtain from him at the proper time an acceptable offer upon which a contract can be let.”

Figure 1.1 illustrates the high level processes that are involved in a basic tender. The four basic steps illustrated however have many sub-processes that are completed by a number of separate parties.

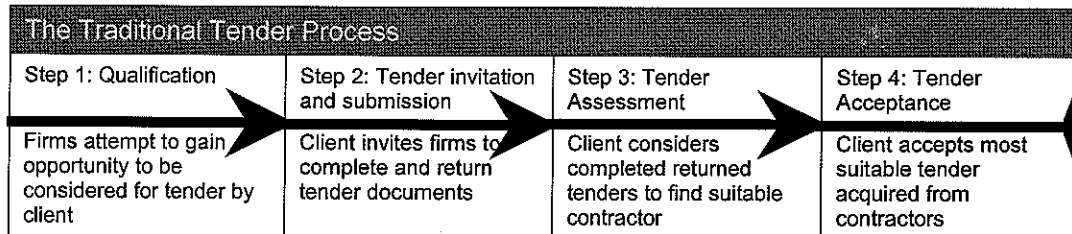


Figure 1.1 Traditional tender process (Adapted from CIOB, 1997)

Hore et al. (1997), Franks (1998) and Ray et al. (1999) all discussed the various types of tendering that are commonplace within the construction industry. The types can range from open tenders to directly negotiated tenders. However, in an international survey completed by Zhang (2004), it was found that over 50% of all tendered projects are completed in a selective tender. In Ireland selective tendering has been specifically outlined by the Code of Practice for Tendering and Contractual Matters (LCPN, 2006).

Hore and West (2004) highlighted the extent to which the re-keying of information in the construction materials acquisition process was inefficient. Their arguments can be similarly directed towards tendering. Tender documents must be transferred between parties in paper format due to the requirements of the LCPN (2006). However, Brooks (2003) pointed out that computers are used throughout the tendering process and that information could be transferred electronically. CRC (2006) indicated that there is usually a significant element of re-keying of information occurring with hard copy transfer during the tender process. With each page of a detailed BOQ requiring item numbering, item description and unit of measurement to be re-keyed, there is a large amount of clerical work to be completed. There are many stages included in this sub-process of tendering. The most labour intensive element is the preparation of the tender package for each trade. Each trade package may contain drawings, specifications and other documentation that the contractor deems necessary to fully describe the project. This individual trade information has to be sorted, photocopied, compiled for each subcontractor and, finally, checked that all information is present before it is delivered in hard copy to the sub-contractor. On many occasions after completing this work, the sub-contractor may not even price the work. This leads to a large amount of time and resources (photocopying/paper) being spent without any return.

CITA carried out a recent survey examining the perceptions of eTendering in the Irish construction industry (CITA, 2006). The survey focused on the level of awareness of eTendering opportunities in the Irish construction industry, current levels of adoption of electronic tendering processes and the perceived barriers to the adoption of eTendering. The results of the survey found that:

- Current levels of adoption of eTendering indicated that a large proportion of firms have received documents electronically but did not return them in an electronic format.

- There is a significant awareness of eTendering and a willingness to adopt eTendering processes in the Irish construction industry, but this is tempered by significant concerns about these processes, including security, legality, commitment by other firms and the technological capabilities within the Irish construction industry.
- Despite the Irish Government's relatively recent eTendering strategy (DETE, 2006), construction professionals perceive that the government is not doing enough to encourage implementation and use of technology on the ground.

The above results are in contrast to the support of the Government and industry in Australia, where they both the Government and industry agree that the implementation of an automated eTendering system enhances the overall quality, timeliness and cost-effectiveness of a tender process, and provides a more streamlined method of submitting, managing and receiving tender documents that the traditional paper-based process (CRC, 2006).

Figure 1.2 illustrates the traditional tendering process of receiving the hard copy tender documents, rekeying the information into bespoke estimating software for pricing, printing and reviewing the priced BOQ and, finally, forwarding the final tender in the format required (CIOB, 1977).

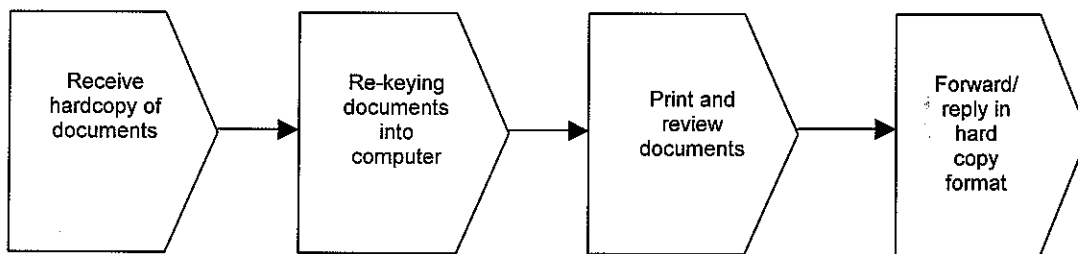


Figure 1.2 Traditional tendering process (Adapted from CIOB, 1997)

Figure 1.3 illustrates the eTendering process which involves receipt of tendering documentation, printing and reviewing documents and finally the pricing and forwarding of the tender documents. As can be seen in the comparison of figures 1.2 and 1.3 there is a reduction in the amount of work required when preparing a tender package when adopting an electronic strategy. Documents are passed electronically between parties instead of by hard copy means. With the introduction of electronic communications several process gains can be made. eTendering has been described as "the electronic issuing and receipt of any tender document as part of the procurement process" (RICS, 2006).

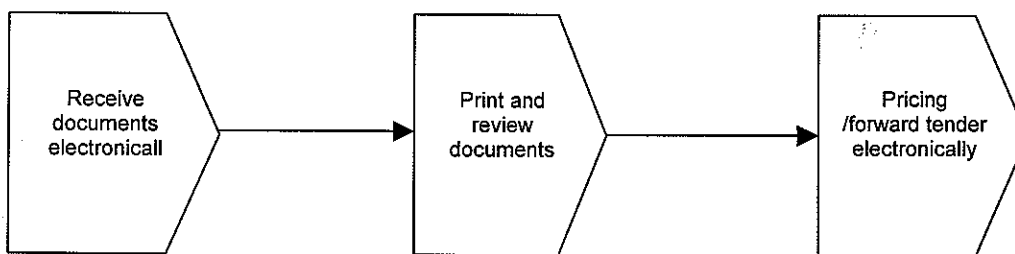


Figure 1.3 Electronic tendering (Adapted from CIOB, 1997)

### 1.3 OBSERVATION STUDY

The authors carried out an observation study in 2006 in order to reaffirm the inefficiencies that currently exist in the construction tendering process. This methodology gave the authors the opportunity to observe first hand the processes that are undertaken in Irish contracting.

The initial pilot observation was carried out between October and December 2006 with a leading main contracting company in Dublin. The observation was on a large project worth in excess of €400million. The authors undertook to observe many of the sub-processes carried out by the main contractor in confirming the tender sum. The documents were received in hard copy format, however full electronic copies of all documents were available upon request. The authors also found that there was significant transfer of information between the main contractor and sub-contractors that was almost exclusively carried out in hard copy.

Table 1.1 outlines both the quantity of information received and the number of tender enquires that were required to be printed, verified, copied and posted/couriered to sub-contractors for one project. On further contact with the sub-contractors it was noted that some had not received the information or indeed were not willing to price the tender having previously committing to doing so. In these instances the entire tender package had to be resent either to the sub contractor in question or to a new sub-contractor.

Table 1.1 Company A - Examples of subcontract enquiry packages during observation study

Subcontract Package	BOQ Pages	Enquiry Page	Specification or any other information	Drawings	Priced by all subcontractors
Groundworks (4 number)	54	Yes	Yes	Yes	Yes
Drywall and Suspended Ceilings (6 number)	64	Yes	No	Yes	No
Painting (4 number)	15	Yes	Yes	No	Yes
Balustrade (3 number)	15	Yes	No	Yes	Yes

Figure 1.4 illustrates how tender information is currently dispatched by the Private Practice Quantity Surveyor (PQS) to the contractors and how the contractors in turn send out this information to sub-contractors for ultimate pricing. Figure 1.4 also shows that the number of communication channels open increases with each stage to the tendering process. Alarming throughout the entire process the preferred method of sending/returning information was using hard copy. This involved the printing, faxing/posting (One to two hours for administration staff per sub contract package variable with package size and communication method) of the documents to the sub-contractor. When this was received (after at least 2 days by post where drawings are issued) the sub-contractor priced the BOQ by "inking-in" their rates on the BOQ pages provided and returned via the same method. Further manual input was then required by the contractors' estimators to input the received quotation into their estimating computer programme. In theory, the electronic method would enable instant collation and communication and a copy and paste command to enter the entire BOQ rates into the estimator's master BOQ.

The tendering process observed by the authors was highly paper dependent with re-keying of information at each stage of the process. The cost of preparing the tender packages was very high, and in a number of instances the works were not priced ultimately by sub-contractors (as can be seen in Table 1.1). The practice of "inking-in" the BOQ rates led to arithmetical errors in both main contract and sub-contract tender submissions.

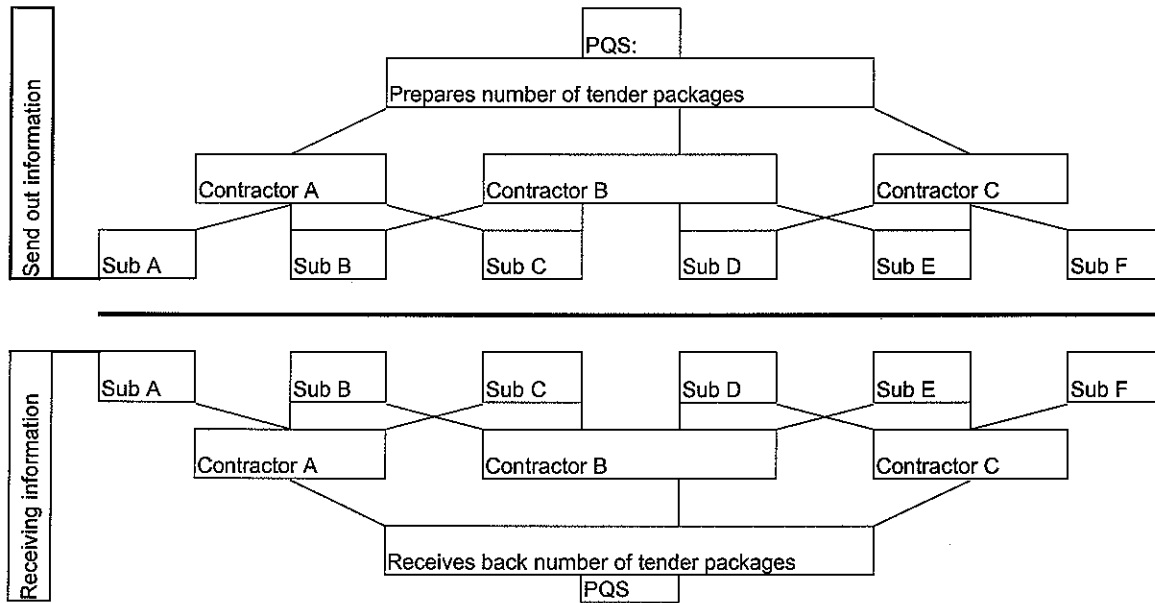


Figure 1.4 Pyramids of information flow observed in tendering process

#### 1.4 CONSTRUCTION IT ALLIANCE

CITA originated as a research project in the Dublin Institute of Technology in 2002. The organisation's goal is to encourage participants in the Irish construction industry to take greater advantage of current and emerging ICT (Thomas and Hore, 2003). The members comprise in excess of 135 corporations drawn from a broad cross-section of the Irish construction industry, including architects, engineers, contractors, suppliers, clients, ICT companies, government departments, state agencies and third level institutions. The main source of funding originates from membership subscriptions with other income sourced from training courses and sponsorship of events. The main activities involve organising bi-annual member meetings, training courses, information dissemination through the organisations website and online newsletters and promoting the work of its Special Interest Group (SIG) network.

#### 1.5 CONSTRUCTION IT ALLIANCE EXCHANGE PROJECT

CITA obtained funding for their project known as the Construction IT Alliance eXchange (CITAX) project under an Industry Led Network Scheme (DETE, 2006). The overall aim of the project is to facilitate more efficient business transactions between companies in the Irish construction sector by the deployment of readily available ICT tools, in particular construction business processes tools, and to radically improve the productivity of these business processes. Furthermore, the use of ICT in a formal way may also improve the quality of available project data, thereby allowing more in-depth analysis.

Early consultation with CITA membership in 2005 identified five core areas that required particular attention. The five core modules identified were: -

- Module 1 - Production and exchange of CAD drawings.
- Module 2 - Production and exchange of trading documentation, such as purchase orders, goods received notes and invoices.

- Module 3 - The pricing of tender documentation electronically and recommendation of a preferred tender for selection.
- Module 4 - The storage, retrieval and general dissemination of project information on construction projects.
- Module 5 - The use of building information model data in the production of bills of quantities.

The longer term objective of the network is to develop a platform for the design and development of open standards that would be promoted within the Irish construction supply chain. Each module has a Project Leader drawn from industry with a representative cross-section of companies from different disciplines participating in the each group, including the support of an academic institution. Figure 1.5 illustrates, at a high level, the methodology adopted in the project. At the time of writing this paper, all of the module plans have been completed and signed-off by the module participants and work is in progress in regard to the analysis of the existing business processes. The remainder of this paper will focus on the work of Module 3 in the process mapping and analysis phase and, in particular, to understand the problems and inefficiencies that exist in the tendering process.

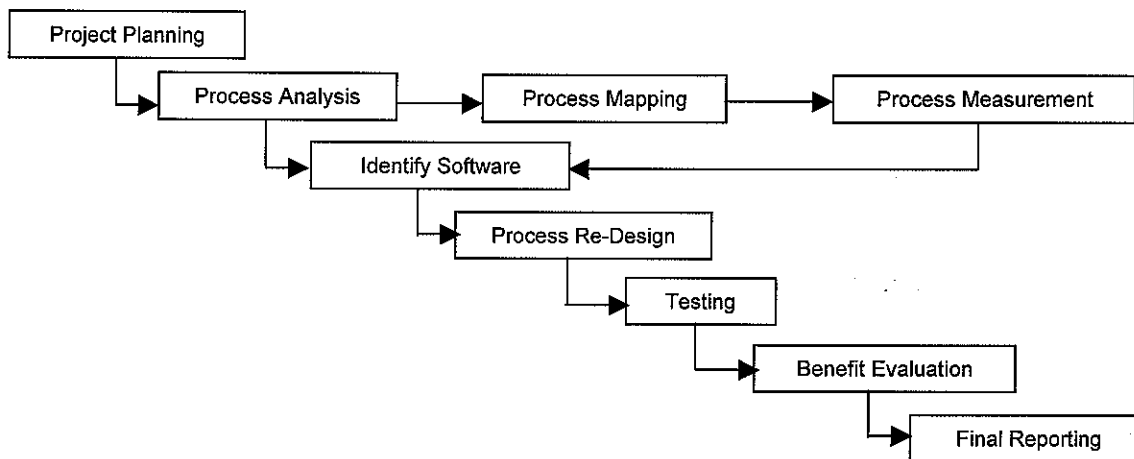


Figure 1.5 CITAX methodology

## 1.6 CITAX MODULE 3 - eTendering

### 1.6.1 Background

In 2002 a SIG was set up to establish a protocol and practice guidelines for eTendering within the Irish construction industry. The purpose of the group was to develop a protocol that would be acceptable to all participants, with a view to minimising errors, speeding up the process and creating overall efficiencies in the preparation and submission of tenders. Their work involved carrying out two tasks:

- Reviewing the policy of the Liaison Committee Practice Notes (LCPN).
- Conducting a mock tender exercise to examine the practicability of carrying out a fully electronic tender.

The group carried out a number of mock tenders electronically utilising the Buildsoft Online Tendering Systems (BOLTS). However they experienced major difficulties in converting the data between different software packages. This involved a great deal of time and effort, and they concluded that whilst the technology was available and successful it was not commercially viable at that time to be widely employed in the industry.

### 1.6.2 Aim of Module

The module sought to verify that significant measurable economic benefits can be achieved by collaborating network members through the adoption of an online tendering system on a live construction project. The project deliverables included:

- Re-affirming the inefficiencies that currently exist in the exchange of tender documentation in the construction industry.
- Demonstrate by the adoption of a live pilot project that tender prices can be more efficiently exchanged between trading network members in an online environment.

### 1.6.3 Tendering Process Mapping

Following an agreement on the module plan, an analysis was conducted on the existing business processes. The methodology adopted by the project team involved:-

1. The identification of the activities to be included or excluded as decided in the planning phase.
2. The process was formalised into flow-chart form, including the activities of all likely participants.
3. A top-down approach was adopted in analysing the process, breaking the process down, from higher to lower levels.

In general terms, to avoid unmanageable detail, the analysis did not go below activity level, that is, a job which can be carried out by one person in one phase of work (see Figure 1.6).

The scope under review focused on the tender pricing element of the tender process, excluding the early stages of qualification/invitation and the latter stages of assessment/acceptance. This scope can be seen in Figure 1.7.

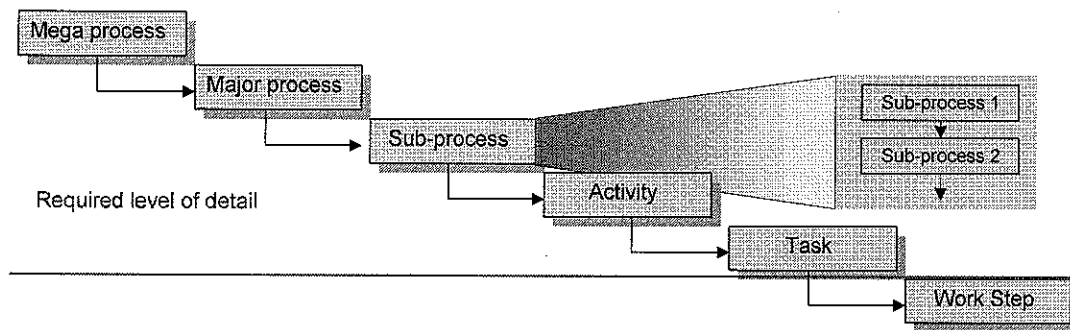


Figure 1.6. Process mapping level of detail (West and Hore, 2007)

The module team consulted widely in order to determine a process map that accurately reflected the constructed tendering process. The results of this consultation are shown in Figure 1.8.



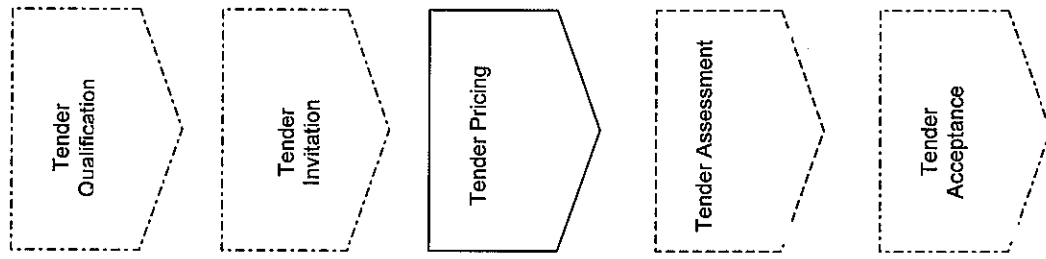


Figure 1.7. Scope of Tendering module (Major Processes)

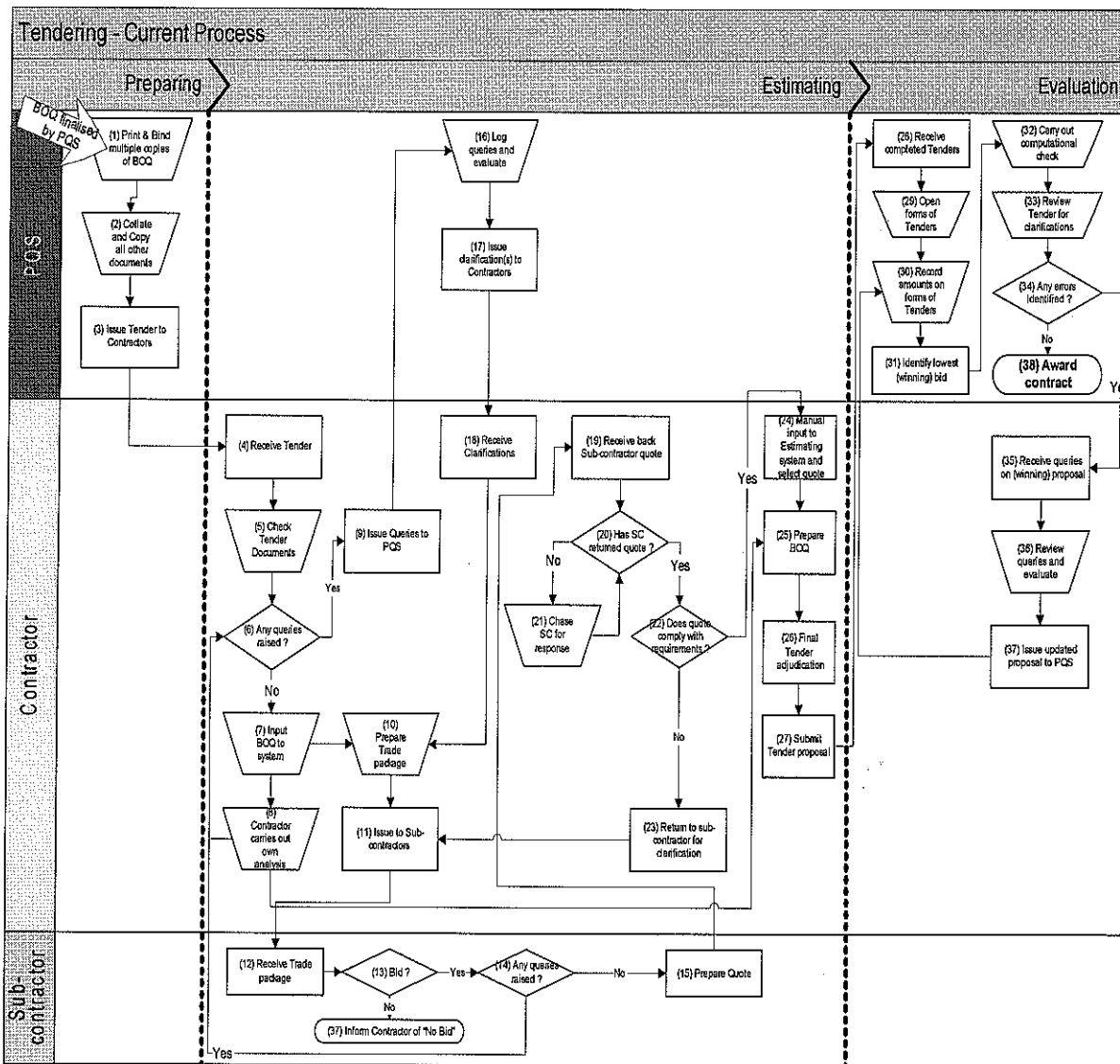


Figure 1.8. Agreed Final CITAX Module 3 tendering sub-process map

The focus of Module 3 starts from the point where the Private Practice Quantity Surveyor (PQS) finalises the BOQ and creates multiple copies of same for distribution to a selected tender list. Additional tender documentation is also collated, such as design drawings, schedules and dispatched with the BOQ. Upon the receipt of the tender documents, the contractor will need to examine such and prepare any queries to raise with the design team.

On receipt of any clarifications from the design team or PQS, the contractor will prepare trade packages and dispatch such to sub-contractors for pricing. The sub-contractor will in turn prepare their bids and submit same to the contractor. The contractor then collates all price data including any bids from sub-contractors and includes indicative prices into their BOQ and adjudicates their tender sum internally. The PQS in the presence normally of the architect and a client representative will open the tenders and follow a particular code of practice for opening and checking tenders. Following these procedural guidelines, a contractor is selected and the process of awarding the contract commences.

The following inefficiencies were identified by the module team:

- Administrative processes within the PQS organisation necessitated having to collate/package/check and distribute multiple copies of the tender package by post.
- Main Contractor receiving BOQ in hard copy format and, in many instances, manually inputs data into estimating software, if unavailable in soft copy.
- Requirement of main contractor to "ink-in" BOQ due to legal constraints.
- Main contractor facing delay of having to forward information to sub-contractor in hard copy (fax/postage).

The module concluded that these inefficient processes could be removed from the current process with the introduction of an electronic tendering system.

#### **1.6.4 Future Work of Module**

At the time of writing this paper the module team were analysing the existing workflow to determine an indicative cost for the process, in order to develop a benchmark from which to compare the ultimately re-designed eTendering process. The module team are currently investigating existing eTendering solutions in the market, with a view to selecting a preferred product for the eTendering implementation phase of the project.

### **1.7 CONCLUSIONS**

Currently there are millions of documents exchanged on paper in the construction industry, each having to be re-keyed as they pass between different locations and computer applications (Cole, 2004). The authors outlined that many authorities believe that collaboration of project teams and the exchange of data between project teams in the construction industry is not efficient (Thomas, 1999 and Gunnigan et al., 2004).

This paper sought to outline the tendering process as it operates today in Ireland by reference to an observation study carried out in 2006 and by identifying the inefficiencies within the traditional tendering communication process. It also outlined how CITA by means of a collaborative project is taking a leading role in enabling the Irish construction industry to harness the greater efficiencies to be had through the deployment of eTendering. There is, however, broad agreement within the Irish construction industry of the need to adopt eTendering processes, but this is tempered by significant concerns about these processes, including security, legality, commitment by other firms and the technological capabilities within the Irish construction supply chain (CITA, 2006).

There is a general awareness in the construction industry of the benefit of deploying readily available ICTs in improving tendering processes in construction (CITA, 2006 and CRC, 2006). The

lack of a common data exchange standard in the construction industry increases implementation costs (Cole, 2004). The reality, however, is that in order to achieve these business benefits, the larger construction companies need to invest in ICT. Future research will need to show how the Irish construction supply chain can benefit overall from an industry-wide solution, given the large number of small players in the marketplace. In order to achieve this, closer collaboration is needed between the major players in the industry and longer term relationships are needed between supply chain organisations.

The CITAX project and the observation studies reported in this paper are at a relative early stage and the research work is not yet complete. There needs to be a level of awareness among both contractors and sub-contractors in the Irish construction industry that traditional paper-based dependent processes should not be maintained in modern construction businesses into the future. It has been shown that ICT significantly enhances productivity and provides ready access to electronic data which is easier to manipulate and analyse.

The construction industry approaches any change in business processes, whether it involves technology or not, with some trepidation (Rankin et al., 2006). For more widespread use of eTendering business processes the Irish construction industry must standardise the data sets and interfaces to provide interoperability. In an ideal system, each piece of data would be entered only once and be available to any ICT system in the tendering supply chain that needs it.

This paper has set out a methodology within the CITAX project in which the Irish construction industry can move towards the adoption of eTendering. Its success will inevitably be judged by the extent of its adoption, a problem exacerbated by the diverse nature of the industry's players.

#### *Acknowledgements*

The authors would like to extend their thanks to individuals at CITA, Aidan Fitzpatrick of Talbot and Associates, Steven Cooke of Bruce Shaw Partnership and the estimating and surveying departments at PJ Hegarty & Sons for their input into this paper. The Authors would also wish to thank Enterprise Ireland for their financial Assistance of the CITAX project.

#### **1.8 REFERENCES**

- Brooks, M., 2003, *Estimating and Tendering for Construction work*, 3rd ed., (London: Elsevier Butterworth Heinemann).
- Chartered Institute of Building (CIOB), 1997, *Code of Estimating Practice*, (London: Longman)
- Construction Information Technology Alliance (CITA), 2006, CITA E-tendering Survey.
- Cole, T.C., 2004, The effective implementation of E-Business, *Incite 2004 Conference, Designing, Managing and Supporting Construction Projects Through Innovation an IT Solutions*, (Malaysia: Langkawi) , 253-258.
- Cooperative Research for Construction (CRC) Innovation, 2006, *Guidelines for successful eTendering Implementation*, (Brisbane: Queensland).
- Department of Enterprise, Trade and Employment (DETE), 2006, *Implementing the National eBusiness Strategy of the Department of Enterprise, Trade and Employment*, (Dublin: Government Publication).
- Franks F, 1998, *Building Procurement Systems: A Client's Guide*, (London: Longman).
- Froese, T., 2003, Future directions for IFC-based interoperability, *Electronic Journal of Information Technology in Construction*, 8, 231-246.

- Gunnigan, L., Orr T.L.L. and Hore, A.V., 2004, Rationalising the construction materials purchasing process, *The International Salford Centre for Research and Innovation (SCRI), Research Symposium and International Built and Human Research Work*, Salford University, Manchester, 376-385.
- Hore A.V. and West, R.P., 2004, A proposal for re-engineering the procurement of building materials by the effective use of ICT, *Incite 2004 conference, Designing managing and supporting construction projects through innovation and IT solutions*, (Malaysia: Langkawi), 375-380.
- Hore, A.V., Kehoe, J.G., McMullan, R. and Penton, M.R., 1997, *Construction 1; Management, Finance, Measurement*, (London: MacMillian Press Ltd).
- Liaison Committee Practice Notes (LCPN), 2006, *Code of Practice for tendering and contractual matters*, (Dublin: Construction Industry Federation).
- Rankin, J., Chen, Y. and Christian, J., 2006, E-procurement in the Atlantic Canadian AEC industry, *Electronic Journal of Information Technology in Construction*, 11, 75-87.
- Ray et al., 1999, Ethics in tendering: a survey of Australian opinion, *Construction Management and Economics*, 17, 139-153.
- Royal Institution of Chartered Surveyors (RICS), 2006, *E-Tendering RICS Guidance Note*, (London: RICS Business Services ltd)
- Runeson, G. And Skitmore, M., 1990, Tendering Theory revisited, *Construction Management and Economics*, 17, 285-296.
- Thomas K., 1999, A study of the use of information technology in the Republic of Ireland construction sector, *The International Journal for Construction Information Technology*, 7(1), 21-34.
- Thomas, K. and Hore A.V., 2003, A reflection on the development, activities and deliverables of the Construction IT Alliance (CITA) in Ireland, *CIB W89, International Conference on Building Education and Research*, 9-11 April, 381-395.
- West, R.P. and Hore, A.V., 2007, *CITAX: Defining XML standards for data exchange in the construction industry supply chain*, *Bringing ICT Knowledge to Work, 24<sup>th</sup> W78 CIB conference, Maribor 2007, 5<sup>th</sup> ITCEDU Workshop and 15<sup>th</sup> EC-ICE Workshop*, Slovenia: Maribor, 26-29<sup>th</sup> September (To be published)
- Zhang, X., 2004, Concessionaire Selection: Methods and Criteria, *Journal of Construction Engineering and Management*, 130(2), March/April, 235-244