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Efficiency Gains to be Won Through the Introduction of Electronic Tendering in the Construction Industry

Alan V. Hore
Technological University Dublin, alan.hore@tudublin.ie

Roger West
Trinity College Dublin, rwest@tcd.ie

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"EFFICIENCY GAINS TO BE WON THOUGH THE INTRODUCTION OF ELECTRONIC TENDERING IN THE CONSTRUCTION INDUSTRY"

Alan V Hore[1], Larry O'Connell[2] and Roger West[3]

ABSTRACT

The tendering process predominantly adopted in the Irish construction industry is largely paper-dependent. However, the increase in the availability of high speed Information Communications Technology (ICT) has meant that construction consultants can disseminate this information more cost effectively in an electronic format. The aim of this paper is to 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 demonstrate how greater effectiveness and efficiency can be applied to the tendering process by the application of ICT already used widely in other industries. The status report outlines the approach taken in the project, the difficulties encountered, the solutions adopted and the steps to be taken to bring about wide-scale adoption of the technology. The project will specifically focus on the exchange of data between network members by quantifying the inefficiencies in current processes and by demonstrating the benefits to be won through a live eTendering project. The paper will not just focus on how to improve this paper-orientated process but will also compare the work of CITA with several other approaches under development globally by different research groups.

KEY WORDS

construction, electronic tendering, information exchange

INTRODUCTION

Over recent decades, industry generally has come to recognise the inefficiencies that exist in paper-based systems. Many sectors of industry have replaced their paper-based systems with electronic systems. The construction sector, however, lags behind other business sectors in harnessing the greater potential of ICT (Thomas and Hore 2003, Gunnigan et al. 2004, Hore and West 2005).

The Canadian Construction Association (CCA) (2005) found that tendering costs can account for up to 5.85% of the total value of a project cost to a client on a typical construction project. There are many hundreds of tender documents produced by consultants, such as tender drawings, project specifications and Bills of Quantities (BOQ). Each of these

[1] Lecturer; School of Real Estate and Construction Economics, Dublin Institute of Technology, Dublin, Republic of Ireland, Phone +353 1 402 3873, FAX +353 1 402 3997, alan.hore@dit.ie

[2] Research student; Dublin Institue of Technology, Dublin, Republic of Ireland, Phone +353 1 4556270, Fax +353 1 4556545, larry.oconnell@pjhegarty.ie

[3] Senior Lecturer; Department of Civil, Structural and Environmental Engineering, Trinity College, Dublin, Republic of Ireland, Phone +35318961832, FAX +35316773072, rwest@tcd.ie

documents is reproduced in multiple copies and dispatched to tenderers on a daily basis, which is an unnecessary expense that is passed on to the client (CITA 2006). ICT tools are used today to support Architecture, Engineering, Construction and Facilities Management (AEC/FM) business processes. The information being processed by 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, 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 CITA is, by means of an industry-led pilot project, taking a leading role in enabling the Irish construction industry to harness the greater efficiencies to be had through deployment of ICT. The paper will not just focus on how to improve this paper-orientated process but will also compare the CITA eTendering project with several other approaches under development globally by different research groups.

TRADITIONAL TENDERING PROCESSES

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 illustrates the high level processes that are involved in a basic tender.

Figure 1: Traditional tender process (Adapted from CIOB 1997)

The Traditional Tender Process			
Step 1: Qualification	Step 2: Tender invitation and submission	Step 3: Tender Assessment	Step 4: Tender Acceptance
Firms attempt to gain opportunity to be considered for tender by client.	Client invites firms to complete and return tender documents.	Client considers completed returned tenders to find suitable contractor.	Client accepts most suitable tender acquired from contractors.

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 Code of Practice for Tendering and Contractual Matters (LPC 2006). Brooks (2003) pointed out that computers are used throughout the tendering process and that information could be transferred electronically. In Australia, the Co-operative Research Centre (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 recently carried out a 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 were 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 in practice.

The above results are in contrast to the support of the Government and industry in Australia, where 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 than the traditional paper-based process provides (CRC 2006).

CONSTRUCTION IT ALLIANCE

The Construction IT Alliance (CITA) originated as a research project in the Dublin Institute of Technology in 2002 and is now an independent limited company. 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 140 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 include the promotion of the work of its Special Interest Group (SIG) network, amongst which is the multi-disciplinary group on e-tendering.

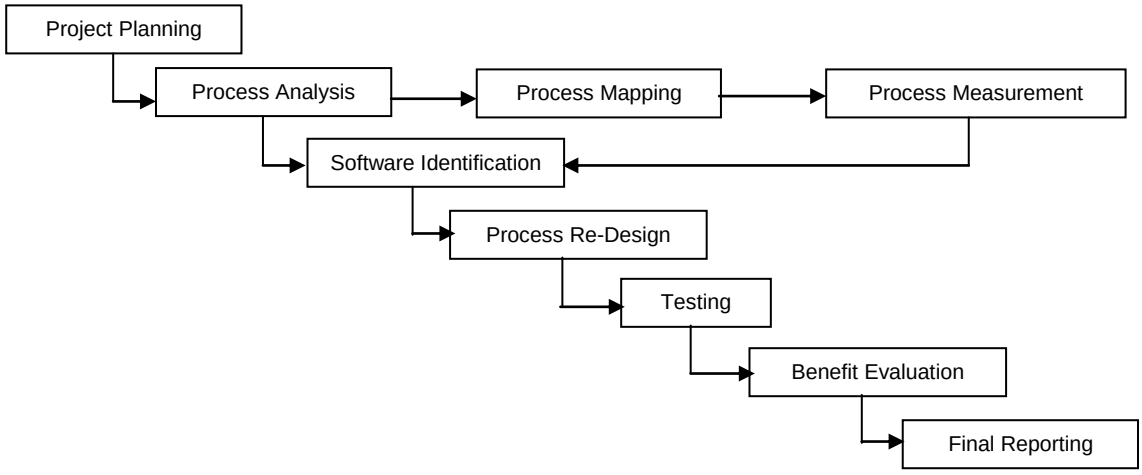
CONSTRUCTION IT ALLIANCE EXCHANGE PROJECT

CITA obtained funding for the Construction IT Alliance eXchange (CITAX) project under an Industry Led Network Scheme (West and Hore 2007). 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.

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 construction supply chain. Their work is divided into modules (such as eTendering, eProcurement, AUTOCAD layering, etc), where each module has a Project Leader drawn from industry with a representative cross-section of companies from different disciplines participating in each module group, including the support of an academic institution. Figure 2 illustrates, at a high level, the methodology adopted in the project.

Figure 2: CITAX methodology



CITAX MODULE ON THE ETENDERING PROCESS

In 2002 a SIG was set up to establish 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 principally 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.

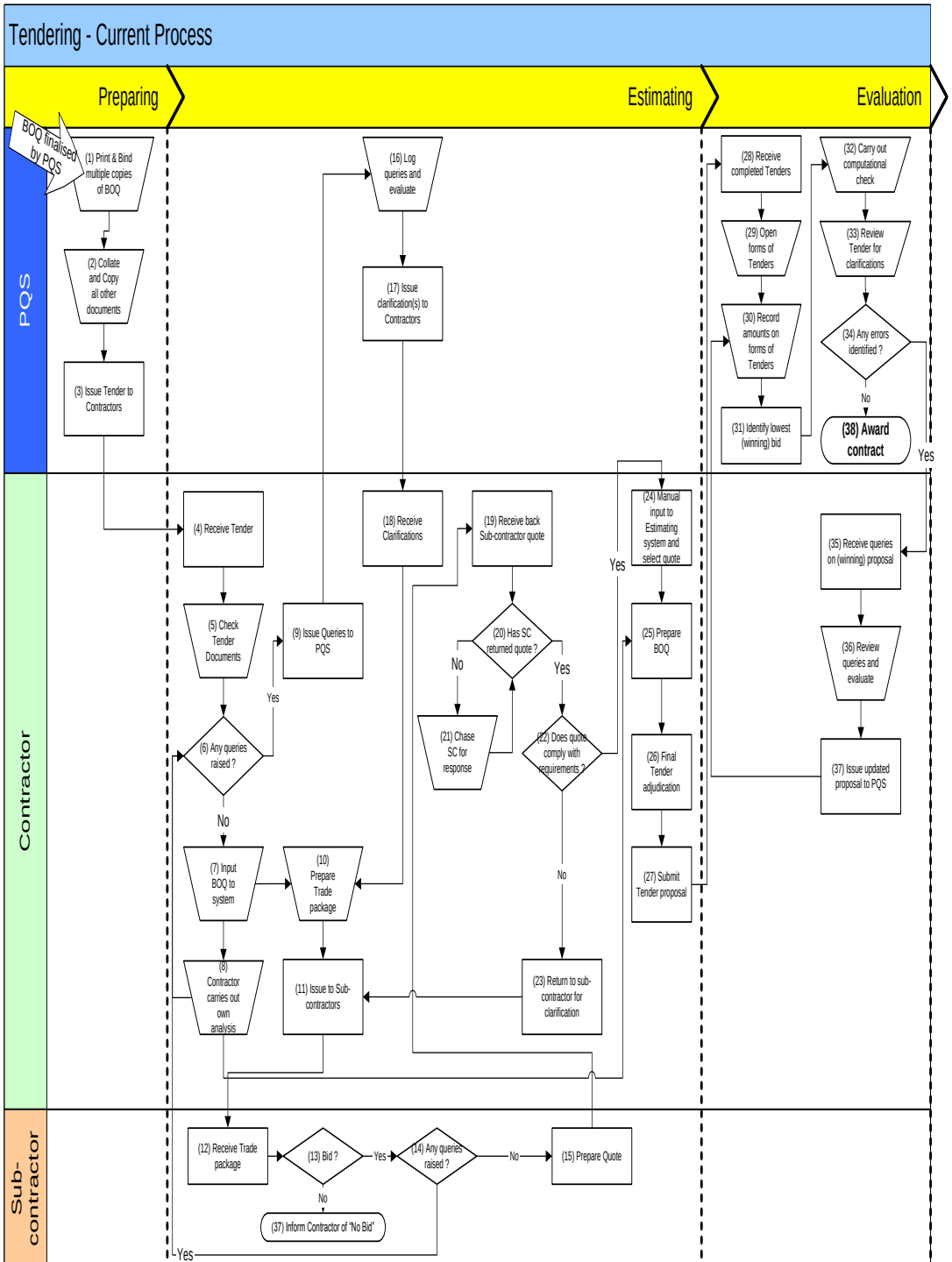
The group carried out a number of mock tenders electronically utilising the Buildsoft Online Tendering Systems (BOLTS). However, they experienced major difficulties in converting the data between different software packages. They concluded that whilst the technology was available and functioning, it was not sufficiently commercially viable at that time to be widely employed in the industry. Further to this research, the CITAX group (Module 3) is seeking 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 include:

- Quantifying the known inefficiencies that currently exist in the exchange of tender documentation in the construction industry.

- Demonstrating, by the adoption of a live pilot project, that tender prices can be more efficiently exchanged between trading network members in an online environment, leading to significant business benefits.

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 3. The process shown in the figure starts from the point where the Private Practice Quantity Surveyor (PQS) finalises the BOQ and creates multiple copies of same for distribution to tenderers on a selected tender list. Additional tender documentation is also collated, such as design drawings and schedules which are 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.

Figure 3: CITAX Module 3 current eTendering process map



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, normally in the presence 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 main 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.
- The Main Contractor receives the tender documents in hard copy format and, in many instances, manually inputs data into estimating software, if unavailable in soft copy.
- There is a requirement of the Main Contractor to "ink-in" the BOQ entries due to legal constraints.
- The Main contractor faces delay and cost of having to forward information to sub-contractors in hard copy (by fax/postage usually).

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 against which to compare the ultimately re-designed eTendering process. The module team is currently investigating existing eTendering solutions in the market, with a view to selecting a preferred product for the eTendering implementation phase of the project. Table 1 summarises typical preliminary costings associated with each of the numbered stages in Figure 3, as prepared by a leading local company, a large Private Quantity Surveying (PQS) practice. Currently a number of additional PQS firms are carrying out their own internal costings to verify these figures.

Table 1: Sample costings associated with the tendering process

Costing of Current Process			
Stage	**Responsibility**	**Process**	**€**
1	PQS	Print & bind multiple copies of BOQ	581
2	PQS	Collate and copy all other documents	8,125
3	PQS	Issue tenders to contractors	350
4-11	Contractor		0
12-15	Sub-Contractor		0
16	PQS	Log queries and evaluate	312
17	PQS	Issue clarification(s) to contractors	138
18-27	Contractor		0
28	PQS	Receive completed tenders	50
29	PQS	Open Forms of tender	43
30	PQS	Record amounts on form of tender	87
31	PQS	Identify lowest (winning) bid	87
32	PQS	Carry our computational check	287
33	PQS	Review tender for clarifications	287
34	PQS	Any errors identified	0
35-37	Contractor		0
		Approximate Sub-total	10,350
		Average number of tenders per year	150
		Total cost of tender process for PQS firm	1,552,500

Note:- Each of the figures presented above have a detailed breakdown of the resources expended in carrying out the various activities in the tendering process.

E-TENDERING – AN INTERNATIONAL PERSPECTIVE

Internationally there is desire of governments to be at the forefront of technological advances and for public procurement, including e-Tendering, to be used as a vehicle for the achievement of a number of public policy objectives. (Tonkin 2003). For example, one of the most thorough approaches to eTendering is in Canada, where they already have in place a full scale eTendering system. The Ontario Electronic Commerce Act and the Canadian Personal Information and Electronic Documents Act provide efficacy to electronic contracts by guaranteeing that they have the same binding affect as traditional contracts. Importantly, the legislation also provides validity to the concept of electronic signatures. The Canadian Construction Association (CCA) has recently published a comprehensive set of eTendering guidelines that will form the basis of a revision to their Canadian Construction Documents Committee (CCDC) Guideline 23 dealing with calling electronic bids and awarding contracts (CCDA 2005).

The CRC in Australia published guidelines on successful eTendering implementation in 2006 (CRC 2006) summarising the outcome of a collaborative investigation by academic and state institutions. The guidelines recommended 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 than the traditional paper-based process.

In Ireland, the National Public Procurement Policy Unit (NPPPU) under the aegis of the Department of Finance, has developed the etenders.gov.ie website which is currently used by some 1,600 state and local government bodies and boasts a register of 30,000 suppliers. All public sector procurement opportunities advertised in the national press or in the Official Journal of the European Union (OJEC) appear on the website. One feature of the website is the electronic post box facility, which allows suppliers to submit tender applications electronically in a secure internet protocol. Whilst this facility suits advertising or certain types of tenders, it is not feasible to electronically upload infrastructural plans off architectural drawings due to the lack of storage and broadband width requirements (Tonkin 2003).

In Ireland, the Local Government Computer Services Board (LGCSB) and the National Roads Authority (NRA) have developed the CONVAL eTendering solution to replace their existing paper tendering system. CONVAL is an engineering application that is used throughout the project lifecyle in civil engineering projects. The basic CONVAL system is used in the tendering (BOQ production) and at the contract (valuation management) stages of a project.

The Construction Faculty of the Royal Institution of Chartered Surveyors (RICS) recently published a guidance document on eTendering in construction in 2006 (RICS 2006). The guidance notes provided useful best practice information on eTendering for anyone involved in the tendering and procurement process. The notes examined the tendering process, from preliminary enquiry through to tender acceptance and withdrawal, and considered the practical and legal implications of eTendering.

There are very few studies, however, that systematically evaluate actual costs and benefits associated with various forms of eTendering in the public sector and there are even fewer of these published. There are many reports that assert savings and benefits but many such assertions are theoretical or ambiguous. An example is to be found in the Strategy for the Implementation of eProcurement in the Irish public sector (DoF 2002). In this report it

appears that certain savings are identified (but not verified) in relation to the use of eProcurement based on the levels of savings asserted in other jurisdictions.

A common thread with international eProcurement public sector studies is the absence of adequate baseline information for assessing the associated cost/benefit movements. For example, the Irish government in the said strategy document (DoF 2002) would appear to be basing their estimates on asserted percentages of savings identified in other jurisdictions, with no scientific foundation to these figures (Tonkin 2003).

CASE STUDY – WOKING BOROUGH COUNCIL

An interesting approach to capturing cost savings associated with eTendering was carried out by the UK Woking Borough Council in 2003 (WBC 2003). The council decided to run a pilot project where the traditional tender process was run in parallel with a fully electronic solution. The project provided a Return on Investment (ROI) process to enable the council to assess the business productivity issues associated with eProcurement, whilst benchmarking actual procurement savings.

Suppliers were asked to complete both tenders and a survey was generated post tender, to review issues of implementation and operation. Internally, the review team modeled this twin process, a manual score regime was applied and a software based score process was repeated after a time break (for quality control). The results of this process were then reviewed in a range of qualitative and quantitative assessments for change management issues and ROI savings. The manual process was gauged to be 54 hours on average and the time saved was estimated to be in the region of 76%. Based on a simple ROI the automated eTendering process was found to deliver impressive productivity savings. The activities for the current paper-dependent process took 256 man-hours. The same activities carried out electronically took 148 hours, which represented a 58% reduction in time. The authority reported that based on a flat rate per hour of £50, the eTendering solution was estimated to reduce the cost to the council from £13,000 to £5,400 for a typical road project (which is comparable to the Table 1 findings). The actual time from tender creation to submission was reduced by an average of approximately 50% and the time to manage the tender responses (receipt, data entry and data analysis) was reduced by an average of approximately 60%, with analysis time dropping by up to 80%. In addition the council reported printing, production and distribution savings.

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, Gunnigan et al. 2004).

This paper sought to outline the tendering process as it operates today in Ireland by reference to the CITAX project which is identifying the inefficiencies within the traditional tendering communication process. 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 business benefit of deploying readily available ICTs in improving tendering processes in construction (CITA 2006, CRC 2006). The lack of a common data exchange standard in the construction industry significantly hampers progress and 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 reported in this paper is well advanced. 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. 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 (West and Hore 2007).

This paper has set out a methodology, within the CITAX project, in which the Irish construction industry can move towards the full 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.

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