
Electronic Tendering: An Industry Perspective

Report 2001-008-C-07

The research described in this report was carried out by:

Project Leader	Dr Stephen Kajewski (QUT)
Team Members	Paul Tilley, Mr John Crawford, Todd Remmers (CSIRO) Professor Swee-Eng Chen, Professor Dennis Lenard, Graham Brewer, Rod Gameson, Richard Kolomy, Rui Martins, Willy Sher (UN)
Researcher	Mr Achim Weippert (QUT)
Project Affiliates	Mr Geoff Caldwell (QDMR), Mr Mark Haug (QDPW)

**Research Program C:
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**Project 2001-008-C:
Project Team Integration: Communication, Coordination and Decision Support**

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PREFACE

The Cooperative Research Centre (CRC) for Construction Innovation research project 2001-008-C: *'Project Team Integration: Communication, Coordination and Decision Support'*, is supported by a number of Australian industry, government and university based project partners including: Queensland University of Technology (QUT); Commonwealth Scientific Industrial Research Organisation (CSIRO), University of Newcastle; Queensland Department of Public Works (QDPW); and the Queensland Department of Main Roads (QDMR).

Supporting the project's research aims and objectives, and as a major deliverable for the project, this report is not intended as a comprehensive statement of best practice. Rather it should be read as an overall 'snapshot' of current public and private construction industry sector state-of-play concerning electronic tendering (e-Tendering) - ascertaining the barriers and enablers from both a technological and end-user perspective.

EXECUTIVE SUMMARY

The construction industry is categorised as being an information-intensive industry and described as one of the most important industries in any developed country, facing a period of rapid and unparalleled change (Industry Science Resources 1999) (Love P.E.D., Tucker S.N. et al. 1996). Project communications are becoming increasingly complex, with a growing need and fundamental drive to collaborate electronically at project level and beyond (Olesen K. and Myers M.D. 1999; Thorpe T. and Mead S. 2001; CITE 2003). Yet, the industry is also identified as having a considerable lack of knowledge and awareness about innovative information and communication technology (ICT) and web-based communication processes, systems and solutions which may prove beneficial in the procurement, delivery and life cycle of projects (NSW Government 1998; Kajewski S. and Weippert A. 2000).

The Internet has debatably revolutionised the way in which information is stored, exchanged and viewed, opening new avenues for business, which only a decade ago were deemed almost inconceivable (DCITA 1998; IIB 2002). In an attempt to put these 'new avenues of business' into perspective, this report provides an overall 'snapshot' of current public and private construction industry sector opportunities and practices in the implementation and application of web-based ICT tools, systems and processes (e-Uptake).

Research found that even with a reserved uptake, the construction industry and its participating organisations are making concerted efforts (fortunately with positive results) in taking up innovative forms of doing business via the internet, including e-Tendering (making it possible to manage the entire tender letting process electronically and online) (Anumba C.J. and Ruikar K. 2002; ITCBP 2003). Furthermore, Government (often a key client within the construction industry), and with its increased tendency to transact its business electronically, undoubtedly has an effect on how various private industry consultants, contractors, suppliers, etc. do business (Murray M. 2003) – by offering a wide range of (current and anticipated) e-facilities / services, including e-Tendering (Ecommerce 2002). Overall, doing business electronically is found to have a profound impact on the way today's construction businesses operate - streamlining existing processes, with the growth in innovative tools, such as e-Tender, offering the construction industry new responsibilities and opportunities for all parties involved (ITCBP 2003). It is therefore important that these opportunities should be accessible to as many construction industry businesses as possible (The Construction Confederation 2001).

Historically, there is a considerable exchange of information between various parties during a tendering process, where accuracy and efficiency of documentation is critical. Traditionally this process is either paper-based (involving large volumes of supporting tender documentation), or via a number of stand-alone, non-compatible computer systems, usually costly to both the client and contractor. As such, having a standard electronic exchange format that allows all parties involved in an electronic tender process to access one system only via the Internet, saves both time and money, eliminates transcription errors and increases speed of bid analysis (The Construction Confederation 2001). Supporting this research project's aims and objectives, researchers set to determine today's construction industry 'current state-of-play' in relation to e-Tendering opportunities. The report also provides brief introductions to several Australian and International e-Tender systems identified during this investigation.

e-Tendering, in its simplest form, is described as the electronic publishing, communicating, accessing, receiving and submitting of all tender related information and documentation via the internet, thereby replacing the traditional paper-based tender processes, and achieving a more efficient and effective business process for all parties involved (NT Government 2000; NT Government 2000; NSW Department of Commerce 2003; NSW Government 2003). Although most of the e-Tender websites investigated at the time, maintain their tendering

processes and capabilities are 'electronic', research shows these 'eTendering' systems vary from being reasonably advanced to more 'basic' electronic tender notification and archiving services for various industry sectors. Research also indicates an e-Tender system should have a number of basic features and capabilities, including:

- All tender documentation to be distributed via a secure web-based tender system – thereby avoiding the need for collating paperwork and couriers.
- The client/purchaser should be able to upload a notice and/or invitation to tender onto the system.
- Notification is sent out electronically (usually via email) for suppliers to download the information and return their responses electronically (online).
- During the tender period, updates and queries are exchanged through the same e-Tender system.
- The client/purchaser should only be able to access the tenders after the deadline has passed.
- All tender related information is held in a central database, which should be easily searchable and fully audited, with all activities recorded.
- It is essential that tender documents are not read or submitted by unauthorised parties.
- Users of the e-Tender system are to be properly identified and registered via controlled access. In simple terms, security has to be as good as if not better than a manual tender process. Data is to be encrypted and users authenticated by means such as digital signatures, electronic certificates or smartcards.
- All parties must be assured that no 'undetected' alterations can be made to any tender.
- The tenderer should be able to amend the bid right up to the deadline – whilst the client/purchaser cannot obtain access until the submission deadline has passed.
- The e-Tender system may also include features such as a database of service providers with spreadsheet-based pricing schedules, which can make it easier for a potential tenderer to electronically prepare and analyse a tender.

Research indicates the efficiency of an e-Tender process is well supported internationally, with a significant number, yet similar, e-Tender benefits identified during this investigation. Both construction industry and Government participants generally agree that the implementation of an automated e-Tendering process or system enhances the overall quality, timeliness and cost-effectiveness of a tender process, and provides a more streamlined method of receiving, managing, and submitting tender documents than the traditional paper-based process. On the other hand, whilst there are undoubtedly many more barriers challenging the successful implementation and adoption of an e-Tendering system or process, researchers have also identified a range of challenges and perceptions that seem to hinder the uptake of this innovative approach to tendering electronically. A central concern seems to be that of security - when industry organisations have to use the Internet for electronic information transfer. As a result, when it comes to e-Tendering, industry participants insist these innovative tendering systems are developed to ensure the utmost security and integrity.

Finally, if Australian organisations continue to explore the competitive 'dynamics' of the construction industry, without realising the current and future, trends and benefits of adopting innovative processes, such as e-Tendering, it will limit their globalising opportunities to expand into overseas markets and allow the continuation of international firms successfully entering local markets. As such, researchers believe increased knowledge, awareness and successful implementation of innovative systems and processes raises great expectations regarding their contribution towards 'stimulating' the globalisation of electronic procurement activities, and improving overall business and project performances throughout the construction industry sectors and overall marketplace (NSW Government 2002; Harty C. 2003; Murray M. 2003; Pietroforte R. 2003). Achieving the successful integration of an innovative e-Tender solution with an existing / traditional process can be a complex, and if not done correctly, could lead to failure (Bourn J. 2002).

1 INTRODUCTION

The construction industry is categorised as being an information-intensive industry and described as one of the most important industries in any developed country, facing a period of rapid and unparalleled change (Industry Science Resources 1999) (Love P.E.D., Tucker S.N. et al. 1996). Efficient information processing is continuously being challenged by the extreme fragmentation of the industry's demand and supply chain - that is, construction work being undertaken by a wide variety of organisations, utilising many different skill sets, processes, and technologies; whilst enduring low profit margins and fierce competition (Pietroforte R. 2003). Current traditional information and communication flows within the construction industry are mostly manual and hence slow:

- Producing numerous paper copies of documents and drawings.
- Management of 'loose' documents is often time-consuming and tedious.
- Library 'archives' of documents need to be maintained to effectively access data as and when required.
- The reliance on third parties, such as courier services, can lead to delays.
- The added expense incurred in the delivery of project documents to project members who are geographically distributed (Anumba C.J. and Ruikar K. 2002).

Towards the end of the 1980's most disciplines within the industry had access to basic software to assist in carrying out relatively complex designs and calculations. During the 1990's the use of e-mail (as an electronic communication device) and the World Wide Web (as an electronic communication device and source of knowledge) was introduced to the industry. Today's construction industry sectors (both public and private) are following a definite and increasing trend towards adapting traditional business methods and processes to the 'new' electronic ways of doing business (e-Business), resulting in many 'divides' being created:

- paper to electronic media;
- local to global commerce;
- management to a leadership focus; and
- reactive to a more proactive state (Russell J.S. 2000; NOIE 2002; Murray M. 2003).

Consequently, project communications are becoming increasingly complex, with a growing need and fundamental drive to collaborate electronically at project level and beyond (Olesen K. and Myers M.D. 1999; Thorpe T. and Mead S. 2001; CITE 2003).

International predictions, relating to the amount of business conducted electronically have reached hundreds of billions of dollars, with little doubt that the emergence of the Internet is 'revolutionising' business access to communication and information. Web-based business activities within Australia, for example, are envisaged to increase significantly throughout the decade (NSW Government 2001; Anumba C.J. and Ruikar K. 2002). These 'e-activities' can generally be described as being about eliminating inefficiencies in traditional processes, communications, etc. and finding 'smarter' ways of undertaking these activities in an electronic environment, and generally requires industry organisational commitment, change and investment (NSW Government 2002).

Unfortunately, there still exists within today's construction industry a considerable lack of knowledge and awareness about innovative information and communication technology (ICT) and web-based communication processes, systems and solutions, which may prove beneficial in the procurement, delivery and life cycle of projects (NSW Government 1998; Kajewski S. and Weippert A. 2000).

Consequently, through increased knowledge, awareness and successful implementation of innovative systems and processes - such as electronic / internet-based tendering (**e-Tendering**) - raises great expectations regarding their contribution towards 'stimulating' the globalisation of electronic procurement activities, and improving overall business and project performances throughout the construction industry sectors and overall marketplace (NSW Government 2002; Harty C. 2003; Murray M. 2003; Pietroforte R. 2003).

2 PROJECT 2001-008-C (Part B): PROJECT TEAM INTEGRATION: COMMUNICATION COORDINATION AND DECISION SUPPORT

2.1 Research Background

Four decades of international construction industry reports reinforce poor communication, information transmission; coordination; and teamwork issues are the cause of countless performance problems in the construction industry. Failure to achieve significant improvements in what are well-identified issues can be linked to the hitherto limited capacity to conceptualise and manage the very complex dynamics in project processes throughout the project's life cycle.

Debatably, today's industries, businesses and personal worlds are dominated by a wide range of technologies and e-activities, including: computers, email, Internet, Web sites, etc., finding it more and more difficult to function without them. Yet, the success of any profession is described as going beyond simply exchanging electronic information. Successful implementation of information and communication technology (ICT) and innovative web-based e-solutions (such as e-Tender) requires careful consideration to meet industry needs. Where future research and developments (R&D) in determining new and improved ways of doing business through the Internet is dependent on the innovation of the industry (and end user), not only the technology itself – that is, matching technological innovation with the perceived needs and preparedness for change on the part of the industry.

Consequently, there is an urgent need to address those key issues that will most significantly influence the construction industry and the way in which it contributes to our society and the economy as a whole in the future. By focusing on the potential of ICT and innovative web-based e-solutions, to better integrate project team members and the construction industry in general.

2.2 Research Aims and Objectives

One of the main objectives of the 2001-008-C (Part B) research project undertaking, is to ***examine construction industry and Government current state-of-play concerning e-Tendering and ascertain the barriers and enablers from both a technological and end-user perspective***. The additional research aims, objectives, activities of this project - not covered in this report - include:

- Demonstrate leadership in facilitating the use of online technologies for the design, management and construction of building and civil construction projects.
- Identify appropriate ICT solutions that will improve resource management, support and integrate total project life cycle considerations, increase efficiencies on projects, ultimately reduce overall cost and improve project outcomes to project participants in the public and private sectors.
- Test, field trial and/or evaluate ICT systems allowing the above issues to be addressed, evaluated and studied in depth.
- Examine the cultural and ICT implementation barriers and needs that challenge organisations and project teams - by focusing on identifying and assessing human and cultural factors, limitations, barriers, and drivers as they arise from the nature of the AEC industry.
- Establish case study projects that will foster the expansion of ICTs in the building and civil construction sectors, thus stimulating the use of such technologies in public and private

building and infrastructure projects – potentially resulting in increased ICT knowledge, awareness and skills of companies in both the public and private sector.

- Demonstrate the benefits and efficiencies obtained through Internet-based Construction Project Management (ICPM) solutions - thereby stimulating improvements and encouraging the wider adoption of such processes in the AEC industries - potentially delivering projects in a timelier and cost efficient manner.
- Demonstrate the potential for the use of hand-held technologies/applications - by examining the existing and emerging technologies not yet embraced by the AEC industries.

To help realise the above project aims and objectives, the project schedule (Appendix I) provides a breakdown of projected research activities, deliverables, milestones, and allocated timeframes.

2.3 e-Tender Report Aims and Objectives

Supporting the above research aims and objectives, and as a major deliverable for the 2001-008-C (Part B) research project (Figure 11-1), this e-Tender report includes:

- an overall 'snapshot' of current public and private construction industry sector opportunities and practices in the implementation and application of web-based ICT tools , systems and processes (e-Uptake);
- identification and evaluation of various e-Tender solutions / systems with regard to their capability, functionality, applicability, and level of uptake within the construction industry;
- identification of benefits and challenges to the adoption of e-Tender systems; and
- consideration of future industry trends and recommendations.

3 E- UPTAKE

The Internet has debatably revolutionised the way in which information is stored, exchanged and viewed, opening new avenues for business, which only a decade ago were deemed almost inconceivable (DCITA 1998) and (IIB 2002). In an attempt to put these 'new avenues of business' into perspective, the following section provides an overall 'snapshot' of current public and private construction industry sector opportunities and practices in the implementation and application of web-based ICT tools, systems and processes (e-Uptake).

3.1 E-Commerce

According to 'Information Technology in Construction Best Practice' (ITCBP), online trading (e-Commerce) is forecast to grow rapidly, with the undertaking of business electronically leading to significant improvements in cost, time and quality of business products and services. Rapid developments in ICT, its uptake, and increase in computer-literate customers' expectations, reinforces the need for companies to reconsider their strategy with respect to e-Commerce and e-Business (ITCBP 2003).

e-Commerce can be defined as *any value adding business exchange conducted electronically within or between businesses, or between businesses and consumers. It covers all forms of electronic trading including electronic data interchange, electronic banking, electronic mail (email) and other online service and communication tools* (NSW Government 2002).

The Queensland Government expects the benefits of e-Commerce and its e-Commerce strategies to include lower costs and wider markets for business, cheaper prices and greater choice for consumers, higher productivity for the economy as a whole and greater effectiveness of Government programs (Queensland Government 2001). The examination of various international case studies in 2001, verify a definite trend for e-Commerce to develop in the construction industry. At the outset, this trend is slower than initially expected, as construction industry companies come to grips with, and eventually embrace, this innovative online business trend (Murray M. 2003).

The Victorian Government states that e-Commerce is profoundly transforming the way people and businesses interact, with worldwide predictions of its potential to reach around US\$300 billion in 2003. e-Commerce has the potential to be a major competitive advantage to businesses, which can lead to:

- improved customer service;
- better business hours;
- reduced inventories;
- an easier and cheaper way of doing business; and
- new competitors / business (Victoria Government 2000).

The construction industry and its participants need to start realising that:

- e-Commerce is here to stay and that the 'open' availability of essential information and data is important to facilitate on-line decision-making.
- Technology can bridge the traditional gap between design and production.
- Joined-up manufacturers, suppliers and off-site production can lead to greater resources for research and development into new products and processes.

- Industry standard models may enable automated information sharing across the entire value chain - from products to projects.
- It is essential for the construction industry to play an active part in setting the world standards that everyone will eventually need to use.
- Specialist contractors, suppliers, contractors and the design team will use web-based project portals to manage the project and its associated information.
- For an industry susceptible to adversarial approaches, the issue of trust in the supply chain will be critical.
- Greater operating effectiveness and supply-chain efficiency needs new skills and talent - attracted through better prospects and changed perceptions (Foresight 2000).

3.2 e-Procurement

e-Procurement covers a wide range of web-based methods and tools (for obtaining prices, awarding and managing contracts, etc) spanning every stage of the purchase of goods or services. This includes e-Tender (Anumba C.J. and Ruikar K. 2002; ITCBP 2003).

e-Procurement can therefore be described as *using e-Commerce for procurement. A business tool and enabler, involving the use of electronic technologies to automate and streamline the procurement processes of an organisation, improving efficiencies and transparency, and thereby reducing the costs of those processes within and between businesses* (NSW Government 2002).

The New South Wales (NSW) Department of Public Works and Services, for example, through their 'NSW Government Electronic Procurement Implementation Strategy', states a key outcome of the strategy is to maximise consistency in approach in implementing e-Procurement and ICT across government agencies and the construction industry (NSW Government 2003). The primary benefit that government agencies, service providers and industry seek to achieve from implementing e-Procurement is to reduce the cost of doing business. As a result, the key objectives of one of its strategies (Strategy 5) includes providing better access to tendering information and streamlining the whole tendering process, by offering electronic access to tender information (e-Tender), thereby providing greater opportunity for business (NSW Government 2002).

3.3 e-Business

e-Business solutions enable local and international businesses to get online quickly and effectively over the Internet (DCITA 1998) and (IIB 2002). Australia (Queensland in particular) is described as being globally competitive, delivering world-class e-Business solutions to a diverse range of clients.

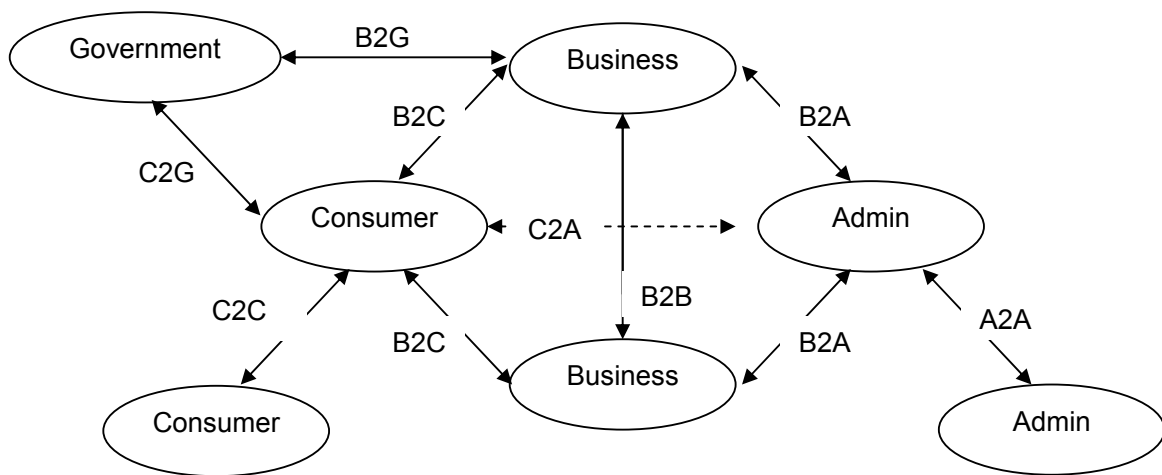
e-Business, in its narrowest sense, can be defined as *the use of information and Internet technologies to conduct business among buyers, sellers and other trading partners* (NOIE 2002).

e-Business solutions can be divided into six main categories, namely (Figure 3-1):

- **Business-to-Business (B2B):** an electronic means of carrying out business transactions between two or more businesses, incorporating everything from manufacturing to service providers – that is, electronic orders, **e-Tender**, receiving electronic invoices and making payments electronically. During the last decade, business-to-business (B2B) e-Commerce has grown rapidly (DIST 1998), mainly because companies needed the related cost-savings and efficiencies to stay competitive.

- **Business-to-Consumer (B2C):** similar in concept to the traditional method of retailing. The main difference being the medium used to carry out business – that is, Internet.
- **Business-to-Administration (B2A):** covers all the transactions that are carried out between businesses and government bodies (e.g. details of government policies, initiatives and other information).
- **Consumer-to-Administration (C2A):** is relatively new through various UK governments initiatives such as:
 - UK Online, which is a joint venture between the UK government, industry, voluntary sector, trades unions, and consumer groups to facilitate Internet access to UK citizens. Facilities include e-Democracy, e-Voting, information about public services, e-Health, and publishing of advantages such as paperless offices, faster communications and reduced costs compared to traditional methods, etc.
- **Consumer-to-Consumer (C2C):** even though no financial transaction takes place, the exchange of value is still deemed as an internet-based economic activity; and
- **Administration-to-Administration (A2A):** where future governments from different countries exchange documents and data or conduct business transactions electronically. (Anumba C.J. and Ruikar K. 2002).
- **Business-to-Government (B2G):** Governments placing their procurement processes online, allowing private companies to bid to tender via the Internet – reducing administration costs and allowing a larger number of private companies to bid.
- **Consumer-to-Government (C2G):** Governments selling, for example, publications, surplus supplies, property and licences, etc. (many of which are auctioned off online) – again reducing administration costs (Ecommerce 2002).

Figure 3-1: Six e-Categories



Adapted from (Anumba C.J. and Ruikar K. 2002) and (Ecommerce 2002)

For successful implementation of any e-Business solution, research indicates a carefully planned strategy based on clear business objectives is essential. Adequate resources must be available and sufficient time allowed results to be achieved. High level backing from a champion will be required and staff expected to operate the new procedures and to be informed and involved from an early stage (ITCBP 2003). (CITE 2003), for example, suggest industry organisations who consider adopting e-Business are to follow three initial steps:

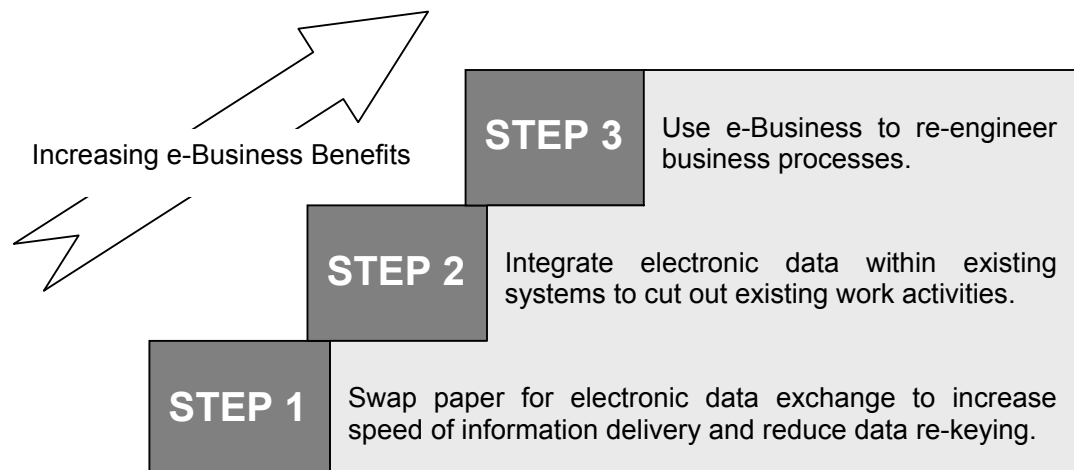
- **Step 1: Ask yourself three questions –**
 - Where is your organisation now in relation to the adoption of e-Business?

- Where do you want to be in the future?
- How are you going to reach that goal?
- **Step 2: Develop an IT strategy.**
 - Develop an IT strategy that is designed to support the vision of the business plan to establish a clear case for moving towards e-Business.
 - A series of high-level guides are suggested to assist in the development of this strategy and to help answer the questions in Step 1.
 - These guides can be obtained at www.itcbp.org.au.
- **Step 3: Ensure success:**
 - The introduction of a new technology or e-process into construction projects is likely to be a success if they are:
 - Easy to use.
 - Rely on existing industry standard hardware and data exchange software.
 - Fully integrate with existing software packages for word processing, etc.
 - Tailored to the particular need of the construction industry.

On a similar note, (The Construction Confederation 2001) identifies a three step approach for organisations who consider adopting e-Business (Figure 3-2). In turn, related benefits from the successful implementation of e-Business include:

- Greater collaboration and improved business relationships;
- Information process efficiencies; and
- Cost reduction.

Figure 3-2: e-Business Implementation and Benefit Scale



(The Construction Confederation 2001)

There is no doubt that e-Business presents some tremendous opportunities for the construction industry, potentially reducing costs and increasing efficiency as well as improve relationships for all its participants. In simple terms, if there are companies that are receiving this business advantage, and your not, they are gaining a competitive edge (The Construction Confederation 2001).

3.4 Summary

As with any application in an age of rapid technological change, construction industry organisations and its people are embracing the various possibilities of changing the way they do business in different ways and degrees (The Construction Confederation 2001). Current and future ICT, e-Commerce, e-Procurement and e-Business developments and their applicability and uptake within the public and private sectors of the construction industry, is causing virtually every business sector to shift away from traditional, tried and tested methods of communications, effectively revolutionising the way today's companies trade and conduct business. Even though certain sectors and stakeholder groups within the construction industry identified as successfully embracing various e-Solutions, the industry's overall e-uptake is unfortunately very much reserved, especially when compared to other engineering sectors (e.g. automotive and aerospace industry). There are justifiably many reasons for this restricted uptake, two of the more 'prominent' being (a) the fragmented nature of the industry, and (b) the one-off nature of its projects (Anumba C.J. and Ruikar K. 2002).

Fortunately, even with a reserved uptake, the construction industry and its participating organisations are making concerted efforts (fortunately with positive results) in taking up innovative forms of doing business via the internet, including e-Tendering – making it possible to manage the entire tender letting process electronically and online (Anumba C.J. and Ruikar K. 2002; ITCBP 2003). Furthermore, Government is very often a key client within the construction industry, with an increased tendency to transact their business electronically, which undoubtedly has an effect on how various private industry consultants, contractors, suppliers, etc. do business (Murray M. 2003). Today's Government departments / agencies offer a wide range of (current and anticipated) e-facilities / services, including e-Tendering (Ecommerce 2002).

Overall, these e-Solutions have a profound impact on the way today's construction businesses operate - everything from marketing through to the collaboration of project team members. Doing business electronically can streamline existing processes, with the growth in innovative tools, such as e-Tender, offering the construction industry new responsibilities and opportunities for all parties involved (ITCBP 2003). It is therefore important that these opportunities should be accessible to as many construction industry businesses as possible (The Construction Confederation 2001).

4 INTERNATIONAL E-TENDER SOLUTIONS

There is a considerable exchange of information between various parties during a tendering process, where accuracy and efficiency of documentation is critical. Traditionally this process is either paper-based (involving large volumes of supporting tender documentation), or via a number of stand-alone, non-compatible computer systems, usually costly to both the client and contractor. As such, having a standard electronic exchange format that allows all parties involved in an electronic tender process to access one system only via the Internet, saves both time and money, eliminates transcription errors and increases speed of bid analysis (The Construction Confederation 2001).

e-Tendering, in its simplest form, is the electronic publishing, communicating, accessing, receiving and submitting of all tender related information and documentation via the internet, thereby replacing the traditional paper-based tender processes, and achieving a more efficient and effective business process for all parties involved (NT Government 2000; NT Government 2000; NSW Department of Commerce 2003; NSW Government 2003).

e-Tendering can be defined as *“the creation and issue of requests for tender and subsequent completion, submission, safe storage, and opening of tenders, using electronic and digital technology”* (NSW Government 2002).

Although there are a number of e-Tender systems available to today's construction industry, they all generally offer:

- some form of messaging function for telling tenderers of any changes;
- document management to keep track of all the information;
- an audit trail;
- a straightforward user interface;
- ways of helping the client compare particular elements of the bids (ITCBP 2003).

Supporting this research project's aims and objectives, researchers set to determine today's construction industry 'current state-of-play' in relation to e-Tendering opportunities. The following sections provide brief introductions to several Australian and International e-Tender systems identified during this investigation. The functionality, capabilities, etc of these e-Tender systems are based on the unrestricted information provided on their web pages. That is, due to the majority of the systems having restricted (username and password protected) access, researchers are unable to fully verify the 'true' capabilities and functionality of the systems (except for the *eTender System* in Section 4.1.1). Thus, researchers do not take any responsibility for any misleading information provided in this section of the report, and should be read as an overall 'snapshot' of the construction industry's potential capabilities and opportunities with regard to the uptake of e-Tendering.

Please note, access to some of these websites may at times not be possible, due to either the page being removed, had its name changed, or is temporarily unavailable whilst being updated. Nonetheless, the hyperlinks to the websites are still provided, based on their accessibility whilst compiling this report.

4.1 Australia

4.1.1 eTender System - Queensland Department of Public Works / Services

Project Services, a commercialised business unit of Queensland Department of Public Works (QDPW), developed a web-based electronic tender system (*eTender*) to manage their building industry tender / offer processes. The *eTender* system incorporates the tendering and selection process for government building projects, covering both building industry consultants and contractors, by encompassing the invitation to tender/offer, access to tender/offer documentation, and tender/offer lodgement via a secure internet site (Figure 4-1). Project Services provided unrestricted access to a demonstration tender project within the *e-Tender* system, allowing project researchers to undertake a more detailed investigation of the system.

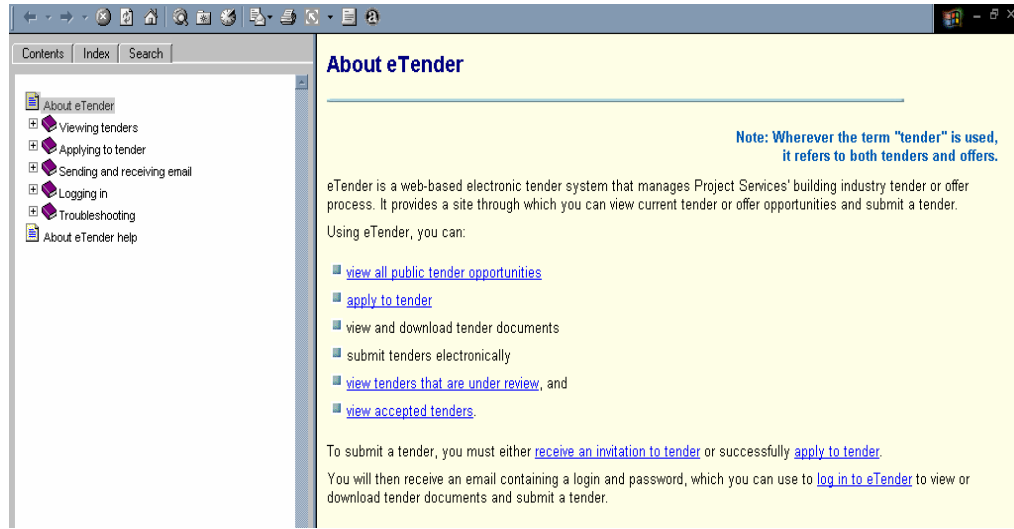
Figure 4-1: Project Services eTender System Home Page



(<https://www.projects-services.qld.gov.au/etender/Default.asp>)

The 'Help' link, shown by the arrow in Figure 4-1, takes visitors to the *eTender* system help page, providing a host of additional information regarding the effective use of the system (Figure 4-2).

Figure 4-2: Project Services eTender System Help Page



(https://www.projectservices.qld.gov.au/etender/General/About_eTender.htm)

The *eTender* system incorporates both open and select tenders (Figure 4-3 and Figure 4-4). In the case of open tenders, information regarding current invitations to tender/offer (including project title, description, and closing date/time) can be viewed by consultants or contractors without a password, and then can register interest to tender/submit an offer on any of the projects for which they are eligible. Once eligibility is confirmed, based on QDPW's prequalification (PQC) registration status, a password is issued to the consultant or contractor for that project. In the case of a select tender/offer, the consultants or contractors are notified of the tender/offer by email, and are supplied with a password to the system (Queensland Government 2002).

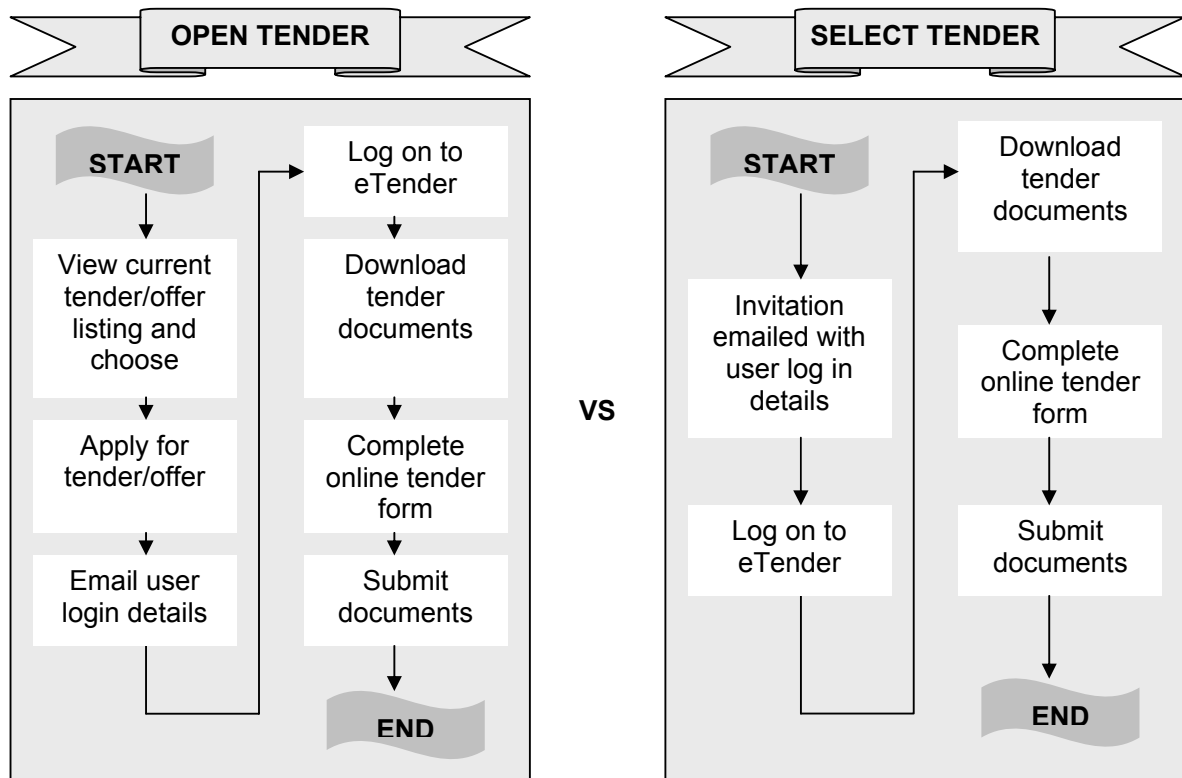
The QDPW's Prequalification (PQC) System provides a comprehensive central register of pre-qualified building industry contractors and consultants, offering clear and consistent performance requirements and guidelines for the selection of all building industry service providers who are eligible to tender (either open or select) on government building projects (including refurbishment and maintenance jobs) via the *eTender* system. Prequalification involves self-assessment against the prequalification criteria of experience, systems, people and business together with statutory and referee checks undertaken by the Department. Successful applicants are awarded one of four PQC Levels ranging from (1) effective work practices, to (4) world's best practice:

- **PQC (Contractors):**

- Prequalification applies to all building industry contractors undertaking Queensland Government building work valued at more than \$250,000. The PQC System is also available to be used to select key trade or specialist subcontractors for trade packages estimated to exceed \$250,000, pending suitable arrangements with the head contractor.
- The PQC System also identifies a contractor's compliance with contractual and legislative requirements, capabilities, commitment to continuous improvement and experience against prescribed criteria.
- Prequalification involves self-assessment against the prequalification criteria of experience, systems, people and business together with statutory and referee checks undertaken by the Department. Successful Applicants are awarded one of four PQC

Levels ranging from effective work practices (1) to world's best practice (4) (Queensland Government 2002).

Figure 4-3: Open vs. Select eTender Process for PQC (Contractor)



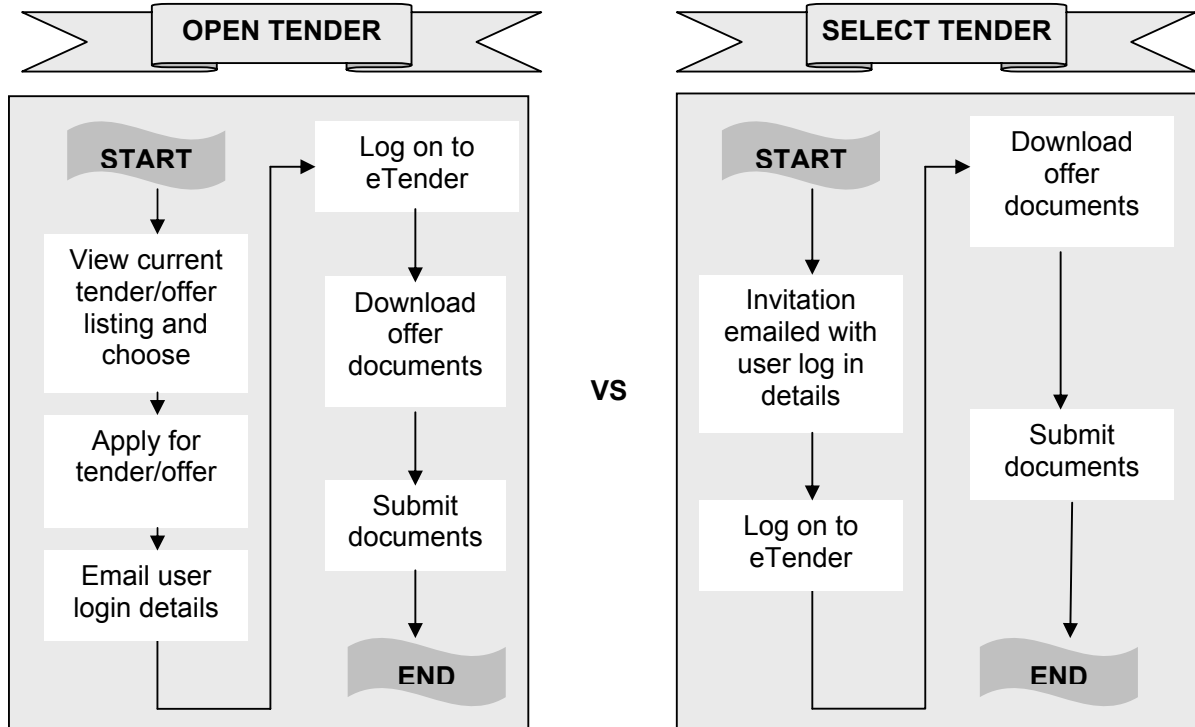
Adapted from (Queensland Government 2002)

- **PQC (Consultants):**

Similarly, the PQC System identifies a consultant's compliance with contractual and legislative requirements, capabilities, commitment to continuous improvement and experience against prescribed criteria. Though in this case, there are two groups of consultancy categories - one that requires a PQC level, and the other that does not:

- The first group - categories include architecture, design, engineering (civil, structural and services), facilities/master planning, health planning, management and quantity surveying - is required to be appropriately registered on the PQC System and obtain a PQC level by completing the self-assessment on the prequalification criteria of experience, systems, people and business. Again, these consultants are then awarded one of four PQC levels ranging from effective work practices (1) to world's best practice (4).
- The second group - categories include compliance, geotechnical engineering, interior design, landscape architecture, surveying, etc. - also requires appropriate registration on the PQC System. This group is not required to obtain a PQC level and likewise, the services associated with these consultancies do not undergo a PQC risk assessment (Queensland Government 2002).

Figure 4-4: Open vs. Select e-Tender Process for PQC (Consultant)



Adapted from (Queensland Government 2002)

For both open and select tenders/offers, all project documentation and information is posted on the *eTender* system Internet site, including conditions of tender/offer, project brief/terms of reference, drawings, specifications, and addenda, which in turn can be viewed or downloaded directly from the system. Access to the tender/offer documentation is password controlled and available only to eligible consultants or contractors on a project basis. The tender/offer is submitted (uploaded) directly to the Internet site. Contractors can also print an on-line tender form (lump sum AS 2124 contracts) prior to or after the tender form is submitted. Additional, yet referenced tender information can also be submitted and attached to appropriate tender forms. Similarly, consultants are able to submit (upload) the proposal together with any additional documentation. Currently, the additional or alternate 'hard-copy' method of submitting tender documentation is still accepted.

Once the invitation to tender/offer has closed, the tender Manager will release the tenders/offers to the evaluation panel. No one, including the Tender Manager, has access to the electronic tender box before it has closed. Email advice regarding initial registration for the project, notification of addenda, and (in the case of contractors) confirmation of lodgement of the on-line tender form or proposal (together with any additional documentation), is automatically dispatched to the users of the *eTender* system. Additionally, all log on, download, and upload activities within the system are recorded.

From a technical perspective, the *eTender* system requires users to have a computer (minimum Pentium 200 with at least 64MB of RAM), Internet connection (minimum 56K V90 modem), web browser (using either Internet Explorer - version 5 or later - or Netscape - version 6 or later), and an email address. Tender documentation files are available for downloading in commonly used

formats (eg doc, pdf, tif, dwg) and sizes kept to a minimum. Bulk downloads of documentation are also available (Queensland Government 2002).

Additionally, Queensland Government Marketplace (QGM) (Queensland Purchasing) have been given access to a second 'version' of the above Project Services developed *eTender* system through which Queensland Government departments and agencies advertise current business opportunities for the supply of goods and services. When first visiting QGM's *eTender* home page (Figure 4-5) one gets the impression that this second 'version' of the *eTender* system is a separate system. After further investigation, researchers determined this was not the case. Although the two 'versions' of the *eTender* systems are hosted on the home pages of two separate government agencies/departments, what happens 'behind the screen', is one and the same – that is, same *eTender* process, functionality and capabilities, with Project Services responsible for the system's maintenance, upgrades, support, etc.

Figure 4-5: Queensland Government Marketplace *eTender* Home Page



(<https://www.projects-services.qld.gov.au/etenderqgm/default.asp>)

Finally, in addition to the above Project Services' *eTender* system investigation, researchers interviewed members of the *eTender* system's technical staff, in an attempt to better understand, validate, clarify, and illustrate the system's functionality and capabilities, both from a technical and end-user perspective. Outcomes of the *eTender* technical investigation can be viewed in Section 5 of this report. Furthermore, in an attempt to better understand, validate, clarify, and illustrate the meaning and step-by-step development of particular end-user *e-Tender* adoption trends, events, barriers, and perceptions ('who', 'how', 'why', 'what' and 'when'), researchers questioned a number of PQC contractors and consultants who used the system. These findings are available in Appendix II.

4.1.2 eTendering System – New South Wales Department of Commerce

Due to its recent incorporation into the Department of Commerce, the New South Wales (NSW) Department of Public Works and Services (DPWS) it is now referred to as the NSW Department of Commerce, (established following the State election on 22 March 2003). The new department does not affect the way existing business units deliver their range of solutions and a new website for the Department of Commerce will be established in the near future.

Although reflecting the traditional tender processes and controls, the NSW Department of Commerce's *eTendering* system allows Government and potential tenderers to save time and effort by streamlining the present tendering system, whilst still complying with the NSW Code of Practice and Code of Tendering for the Construction Industry. The link shown by the arrow in Figure 4-6, takes visitors to the Department of Commerce's *eTendering* system home page (<https://tenders.nsw.gov.au/commerce/>), providing a host of information regarding the use of the system, including a help page that provides a step-by-step guide of the system:

- **Step One – 'Finding the Right Opportunity for You':** details about its browsing and searching functions.
- **Step Two – 'What Information is on NSW eTendering':** tender specific and general tendering related information
- **Step Three – 'Registration of your Details':** discussing the need to register, password details, etc.
- **Step Four – 'How to get the Opportunity Documents':** identifying the two possible methods of collecting tender documents – that is, either downloading a soft copy from the eTendering System, or ordering a hard copy via mail.
- **Step Five – 'Ready to Respond Online':** detailing the process of lodging a response online.
- **Step Six – 'Other Features and Hints':** includes additional information on feedback, links, terms of use, policy documents, hints, etc.

Figure 4-6: NSW Department of Commerce Home Page



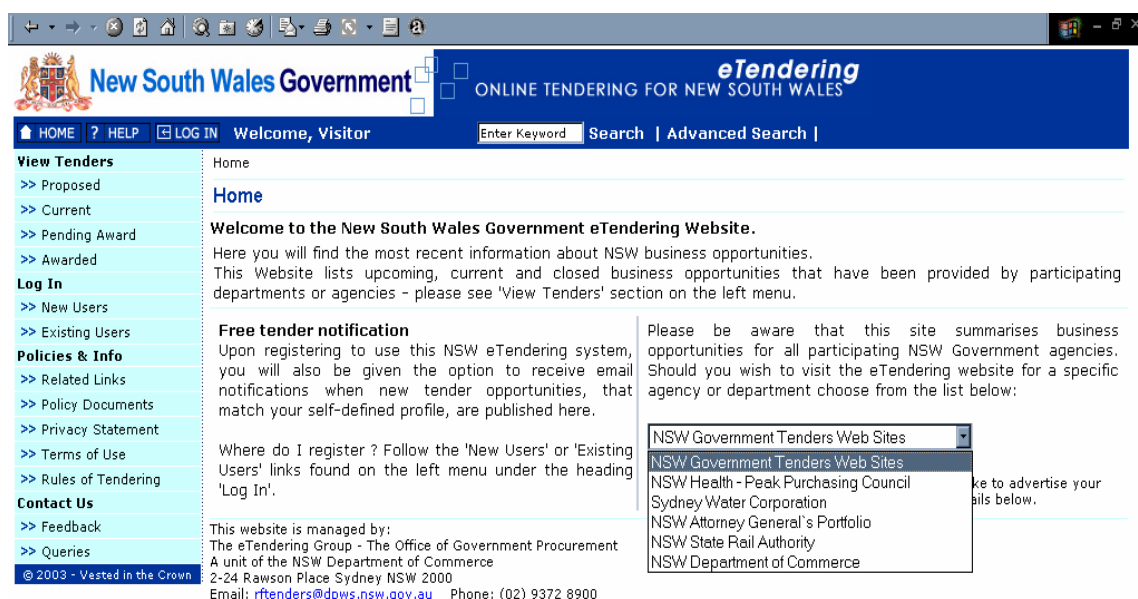
(<http://www.dpws.nsw.gov.au/Home.htm>)

Similar to QDPW Project Services' *eTender System* (Section 4.1.1), the NSW Department of Commerce's *eTendering* system is an online tender system, used since July 2000 by its agencies to provide information about tendering opportunities. The NSW Department of Commerce represents a large number of government clients who have a wide and varying range of needs and requirements, and therefore uses a range of tendering methods to meet these, including:

- **Open Tenders:** Open tenders are invited by public advertisement with no restriction placed on who may tender. Tenderers are required to demonstrate in their tender that they have the necessary skills, resources, experience and financial capacity to carry out the work. Open tenders are usually called for building work of relatively low value (e.g. up to \$0.5M) and for civil engineering works (excluding water and wastewater treatment plants and small town sewerage systems), where it is inefficient to establish selective or pre-registered tender lists.
- **Selective Tenders:** The selective tendering system is where a limited number of Contractors or Consultants are invited to tender for a particular work. Tenderers are chosen from a list of contractors or consultants who are pre-qualified (PQC) with NSW Department of Commerce, with prequalification being based on a proven record of relevant satisfactory performance and financial capability.
- **Pre-Registered Tenders:** When there are a relatively small number of pre-qualified contractors for a particular work category with a continuous workload, pre-registered tenders are used. Pre-registered tenders are invited by public advertisement with the restriction that only those contractors pre-qualified for the type of work will be permitted to tender (NSW Government 2000).

Visitors to the site are also made aware that all business opportunities advertised on the NSW *eTendering* system by participating NSW Government Agencies are listed on the Web site <https://tenders.nsw.gov.au/nsw/> (Figure 4-7).

Figure 4-7: NSW Government eTendering Home Page

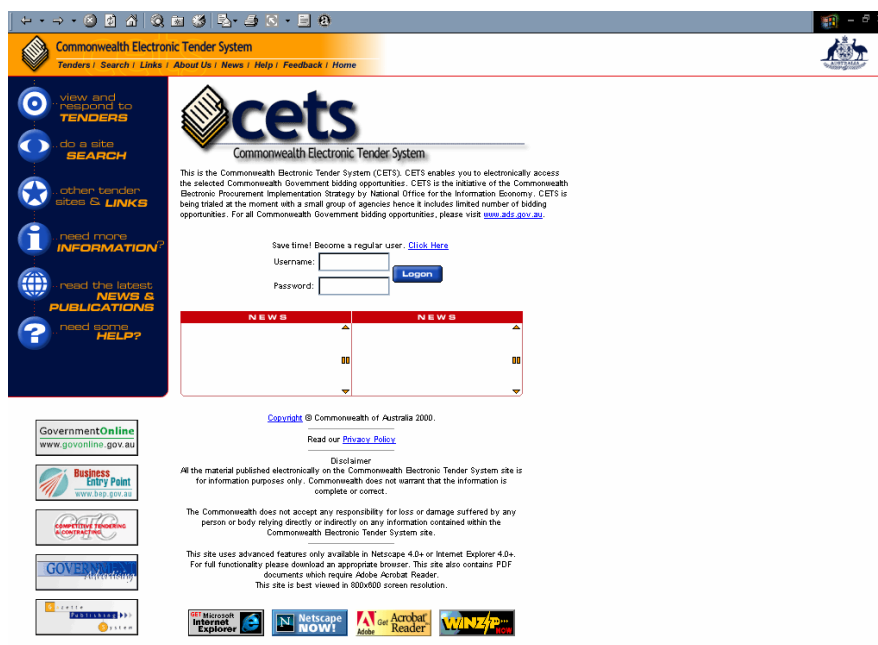


(<https://tenders.nsw.gov.au/nsw/>)

4.1.3 CETS – Commonwealth Government

The Commonwealth Government is committed to being a leading user of online services and demonstrating its benefits. With regard to complex procurement, the Commonwealth Electronic Tender System (CETS) (Figure 4-8), piloted and managed successfully in 2001 by the National Office for the Information Economy (NOIE), allows agencies to conduct tendering and quotation processes online. CETS is the first application of the Government's world-leading Gatekeeper accredited digital certificates in an online procurement system and the first use for a general range of e-commerce activity.

Figure 4-8: CETS Home Page

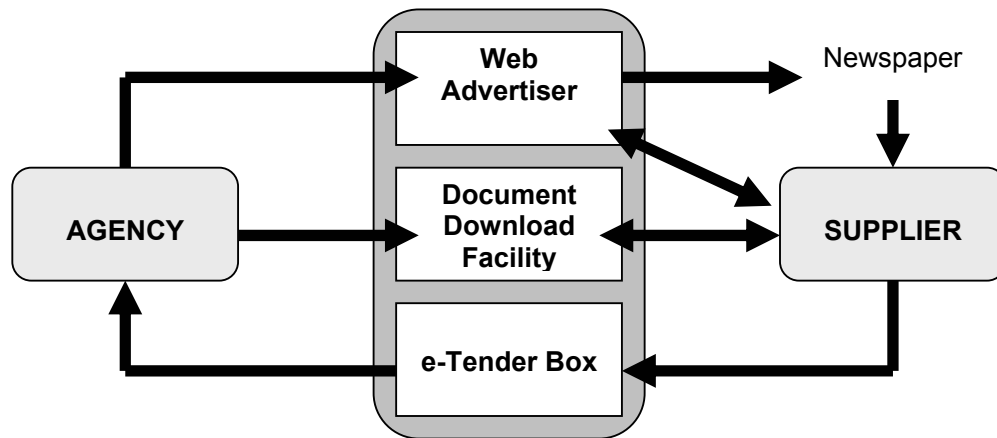


(www.tenders.gov.au)

CETS enables all invitations for tender to be placed on the Web and anyone wishing to submit an application can download the tender specification file and respond using a secure encrypted connection. When the tender response file is uploaded to the website, it is then encrypted using an 'eSign Digital ID' (digital certificate). The encrypted tender response file sits on the server until the tender deadline, when it then becomes available to the agency. The authorised officer can then download the file(s) using that agencies corresponding private key to decrypt the information. The system relies on a Secure Sockets Layer session at 128-bits for the initial encryption of confidential tender responses from suppliers.

CETS aims to provide a facility for suppliers to download tender documents relating to advertised business opportunities. After locating an opportunity that interests the supplier, all documents relating to that request can be downloaded. All uploaded tender responses will be date and time stamped upon receipt and held within the system until the bid closes. The supplier can complete their response then upload the completed documents. Use of the tender lodgement facility, however, is not mandated (NOIE 2003).

Figure 4-9: How CETS Works



(NOIE 2002)

Figure 4-9 provides an illustration as to how CETS works:

- An agency advertises a business opportunity, such as a Request for Tender, on the Commonwealth Government Advertising site at www.ads.gov.au or in a newspaper.
- The agency then uploads the associated tender documentation to the CETS site.
- Having identified an opportunity of interest on www.ads.gov.au or in a newspaper, a supplier can then log in to the CETS site at www.tenders.gov.au, register their contact details and download the relevant tender documentation.
- A supplier wishing to respond prepares the tender offline and then uploads it electronically into the 'Electronic Tender Box' on CETS.
- The tender transmission to the CETS site is encrypted and the tender itself is then encrypted when it is put into the tender box.
- When the tender has closed, the agency 'opens' the 'Electronic Tender Box', downloads any tenders, and decrypts them.
- Contract negotiations - Once a tender has been submitted electronically, the contract may be negotiated using electronic communications such as email, whilst being mindful of the need to protect the confidentiality of sensitive information you send electronically – eg by using secure email (NOIE 2002).

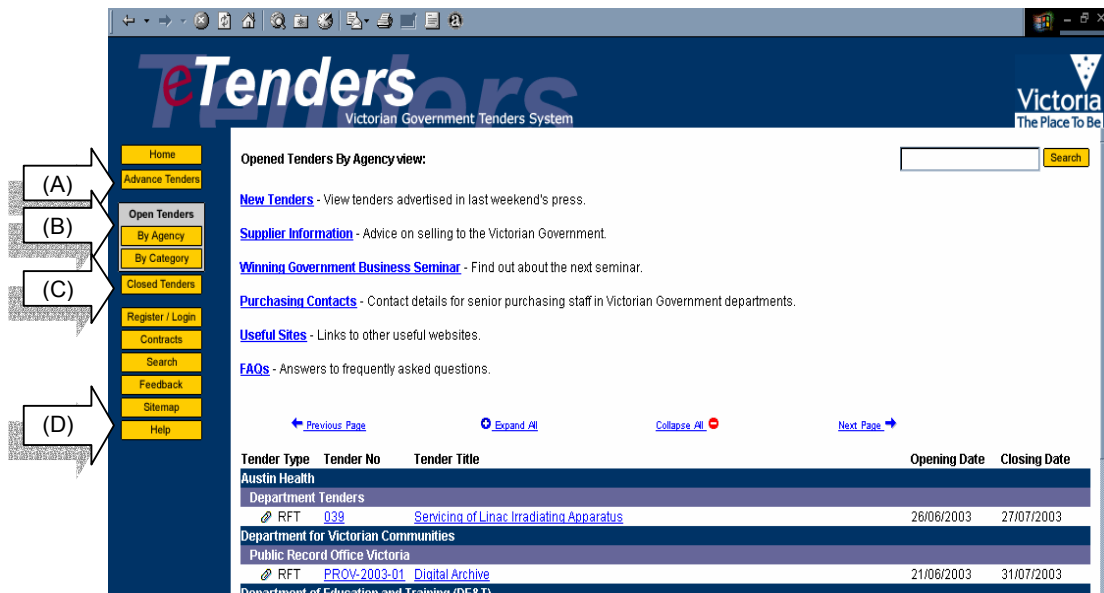
Compared to the QDPW (Section 4.1.1) and NSW Department of Commerce's (Section 4.1.2) eTender systems, CETS seemingly provides slightly less functionality and capability when it comes to 'advanced' electronic tendering. However, the NOIE is committed to the redevelopment of CETS software to provide enhanced functionality, capacity, and robustness, bringing the system up to full production standard in preparation for implementation across Commonwealth agencies from the second quarter of 2003. For example, it is expected that the redeveloped version of CETS will include future advertising function from www.ads.gov.au (NOIE 2002; e-Business Guide 2003).

4.1.4 eTenders System – Victoria Government

Searching the Victorian Government website (<http://www.vic.gov.au/>) for information regarding any eTender initiatives by its various departments, visitors are directed to the *eTenders System*

Victoria Home Page (Figure 4-10), hosting details of tenders currently listed with the Victorian Government.

Figure 4-10: eTenders Victoria Home Page



(<http://www.tenders.vic.gov.au>)

The links in Figure 4-10 (shown by arrows A, B, C and D) allow visitors to access additional tender information regarding the use of the Victorian Government's *eTenders System*:

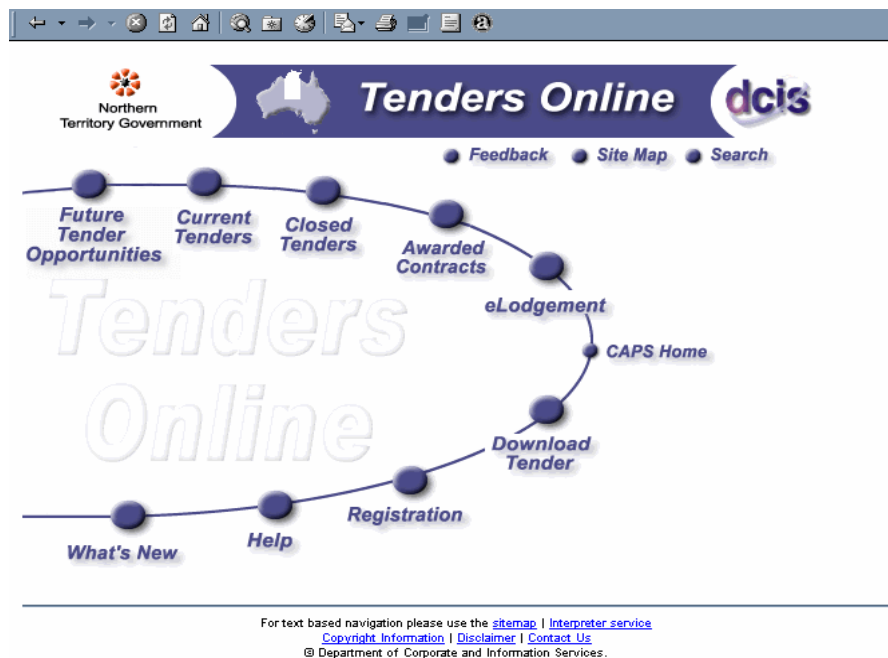
- **(A) - Advance Tenders page:** Provides a list of advance notification of forthcoming tenders including Requests for Tenders (RFT), Registrations of Interest (ROI), Requests for Quotation (RFQ), Expressions of Interest (EOI), and Requests for Information (RFI). Opening dates are said to be approximate and documents will not be available for download until the tender opens. Visitors can access the tender details by simply clicking on the tender number or tender title listed.
- **(B) - Opened Tenders by Agency and Category:** This page lists open tenders by category. Tenders listed on these pages that have a paper clip, provide tender documents for download.
- **(C) - Closed Tenders:** The dates which appear in this list of tenders, refer to the date when the tender closed. The tenders displayed are sorted by closing date. Tender attachments are not available for download in the Closed Tenders section
- **(D) - Help Page:** Here visitors can follow a brief guide regarding registration procedures, viewing of tenders, and use of the *eTenders System* and its search facility.

The Victorian *eTenders System*, when compared to those from QDPW (Section 4.1.1) and NSW Department of Commerce (Section 4.1.2), is not an 'advanced' eTender system as such. It could be described as more of an electronic tender archive and notification system, where, once a visitor is registered, can access and electronically download advanced, open, and closed tender documents, free of charge (Victoria Government 2003).

4.1.5 Tenders Online via eLodgement – Northern Territory Government

To help achieve the goals identified in the NT Government's "*Foundations for our Future*", and "*Industries for a New Century*", the Northern Territory (NT) Government's Contract and Procurement Services (CAPS) Department of Corporate and Information Services, designed and developed an e-Commerce initiative to enable tenderers to lodge tenders electronically. The *Tenders Online* Web site was first established in 1998 to provide tenderers in the construction sector with a single point reference for business opportunities, and has since expanded to list all NT Government publicly invited tender opportunities (Figure 4-11).

Figure 4-11: Tenders Online Home Page



(<http://notes.nt.gov.au/Tender.nsf>)

Tenders Online provides potential tenderers with 24-hour access to tendering information such as current, closed and awarded tenders along with the ability to download electronic copies of the Request for Tender (RFT) documentation. *Tenders Online* offers potential tenderers:

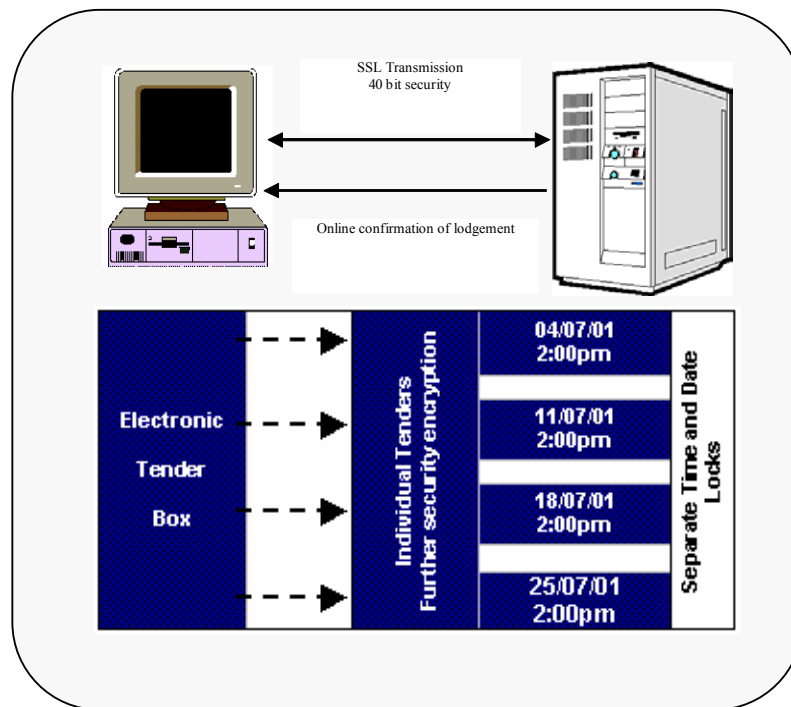
- access to information about the Department of Corporate and Information Services' advertised tenders;
- ability to download tender documents for projects advertised in any Northern Territory centre
- to view the closing lists for all publicly advertised tenders;
- to see all contracts awarded by NT Government from advertised Tenders;
- to send in a request to have documents mailed to them if they are unable to print them;
- to send in comments or request information;
- the option of having addenda emailed to them; and
- to do all of these things at any time, day or night from their home or office (NT Government 2000).

This improved and secure electronic tender lodgement (eLodgement) service does not mean the end of paper or faxed tenders and that all existing lodgement methods will continue to operate (NT Government 2001).

For additional information on NT Government's *Tenders Online* and eLodgement service, visitors can view and/or download a comprehensive and well illustrated 'user manual' (http://www.nt.gov.au/dcis/caps/tenders/help/etl/etl_tenderers_user_manual.pdf), providing detailed and systematic info regarding the Web site and electronic tender process, including:

- Background information;
- Electronic lodgement, storage, and submitting of tender documents;
- Benefits to tenderers;
- Minimum software requirements;
- Registration details (User Name and Password); and
- Security (encryption, 'locking' of date and time, etc) (Figure 4-12).

Figure 4-12: Tenders Online Lodgement and Security



(NT Government 2001)

4.1.6 SA Tenders and Contracts – South Australian Government

Searching the South Australian (SA) Government website (<http://www.sa.gov.au>) for information regarding any eTender activities within its various departments, visitors are directed to SA *Tenders and Contracts* (Figure 4-13), established in 1997 as a central source for public procurement opportunities within SA.

Figure 4-13: SA Tenders and Contracts Home Page



<http://www.tenders.sa.gov.au/index.do>

Similar to *Tenders Online* (Section 4.1.5), the *SA Tenders & Contracts* Web site provides easy-to-use Internet access to all publicly available bidding opportunities by facilitating the electronic submission of responses using the eLodgement Service. Since its establishment, and whilst under a program of ongoing development, the site is said to have 'evolved' from a simple web based bulletin board to a successful e-Tendering system, providing details of SA Government awarded contracts for goods, services and works.

The *SA Tenders & Contracts* website uses Sun Microsystems Java TM software technology for verifiable, efficient and secure transfer of documents. Potential tenderers who wish to electronically download tender documents are asked to install the latest Java TM software, Version 1.4 (<http://java.sun.com/getjava/>) to ensure browser compatibility with the new *SA Tenders & Contracts* website.

To familiarize oneself with the *SA Tenders & Contracts*' process of downloading tender specification documents and to help grasp the basic use of the eLodgement service – that is, to submit an electronic response to tenders - visitors can access the demonstration tender (<http://www.tenders.sa.gov.au/tender/display/tender-details.do?id=3127&action=display-tender-details>). Additionally, the 'Help' / 'FAQ' (frequently asked questions) link (<http://www.tenders.sa.gov.au/faqs/browse.do>) also provides further information regarding the use of the *SA Tenders & Contracts* system, including:

- Password issues
- Software Installation Instructions

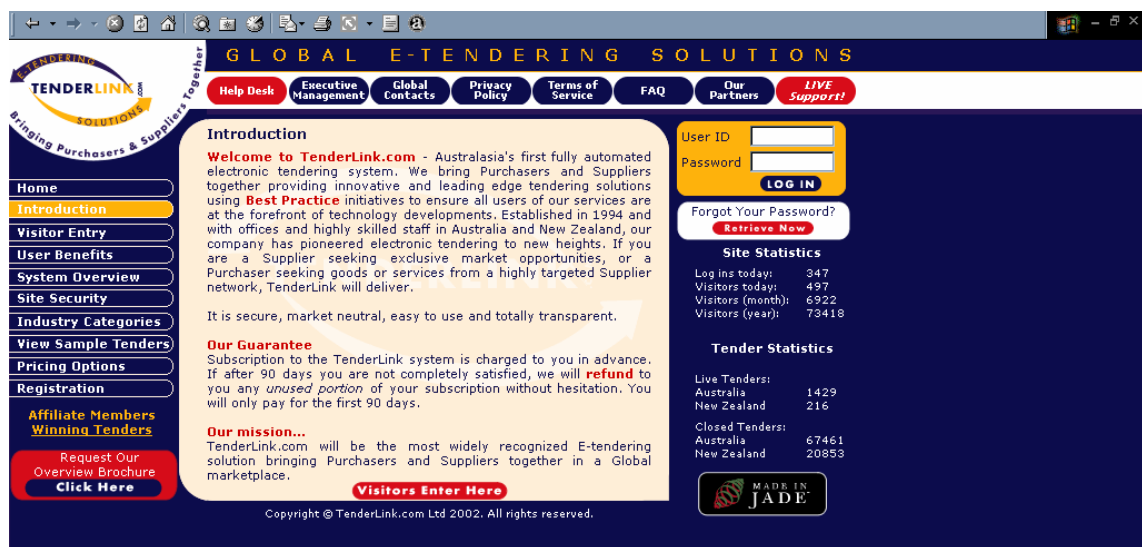
- Troubleshooting
- Subscriptions to the site
- Email notifications
- Collection or downloading of tender documents
- Electronic lodging of tender response

The *SA Tenders & Contracts* website went live on 19 April 2003, intending to provide a series of future training sessions and workshops (SA Government 2003).

4.1.7 Tenderlink - Australasia

Tenderlink claims to be Australasia's first fully automated electronic tendering system (established in 1994), providing its users a strictly business-to-business (B2B) and business-to-government B2G) service (Figure 4-14). With offices in Australia and New Zealand, the *Tenderlink* service is independent and neutral, aiming to facilitate the procurement and supply of services, consultancy, and products regarding prices, quotes, tenders and information. Organisations wishing to engage in tender transactions via *TenderLink* have to be registered (Tenderlink 2002).

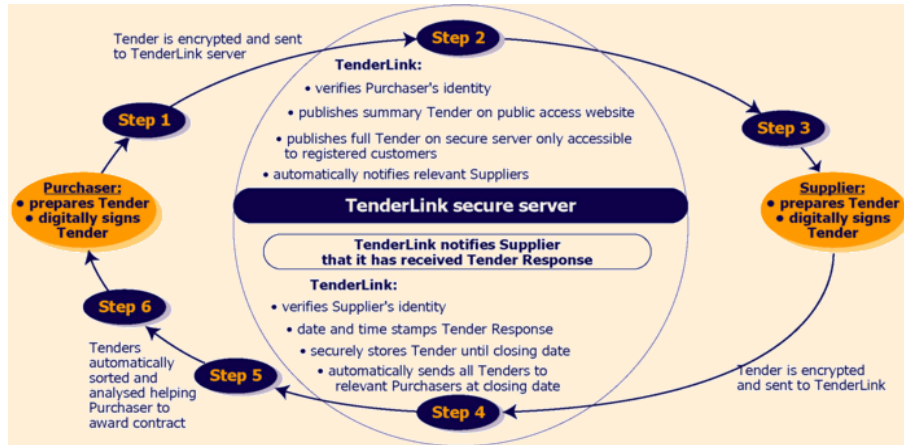
Figure 4-14: Tenderlink.com Home Page



(<http://www.tenderlink.com>)

Tenderlink acknowledges the fact that a number of local and regional councils and government departments make use of various other online tender services, stating these systems are generally limited to published information about their own current tenders. What makes *Tenderlink* unique in this case is that it is a 'commercial system', providing both purchasers and suppliers fully automated functionality and greater access to a complete range of tenders (both in a local and international market) via its own built in communications centre. *Tenderlink* provides its registered members a secure and fully encrypted transaction environment with a full audit trail, password-protected entry, a secure payment gateway, and 128-bit security (believed to be one of the strongest levels of security available and generally accepted by the banking fraternity throughout the world). Figure 4-15 provides a graphical representation of the *Tenderlink* process.

Figure 4-15: Tenderlink Process Model



(Tenderlink 2002)

For additional information on the *Tenderlink System* (either from a purchaser or supplier perspective), refer to the various links located on the home page (<http://www.tenderlink.com>).

4.1.8 Gem Tendering – Western Australia Government

By clicking on the 'tendering information' link on Western Australia (WA) Government's web site (<http://www.wa.gov.au/government.html>), visitors can access the Government Electronic Market (Gem) web site (Figure 4-16). *Gem Tendering*, previously known as the Government Contracting Information Bulletin Board, provides direct access to the latest information about tenders and contracts for WA public sector agencies, local government authorities, private sector providers to government, and international tendering opportunities (WA Government 2001).

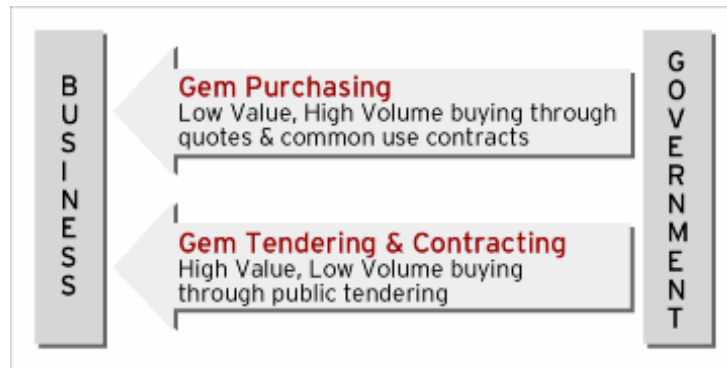
Figure 4-16: Gem Tendering Home Page



(<http://www.gem.wa.gov.au/Gem/Tendering>)

Gem claims to be Australia's first comprehensive online government buying service, managed by the WA Department of Treasury and Finance (DTF). Through Gem, the DTF are creating an online environment in an attempt to streamline traditional business partnerships between the public and private sectors, thereby enhancing the quality, timeliness and cost-effectiveness of current and future services to its community, including that of public tendering (Figure 4-17).

Figure 4-17: Gem Streamlining Business Partnerships



(http://www.gem.wa.gov.au/Gem/About/what_is_gem)

Gem Tendering is reportedly the only central source of information on WA Government tenders and awarded contracts, and streamlining the entire purchasing and tendering process, by providing services such as:

- electronically advertising of current tenders;
- recent tender awards;
- early tender advice;
- downloading of tender documents and drawings; and
- electronic tender lodgement.

Furthermore, more than 20,000 suppliers currently use the *Gem Tendering* system to view existing and future awarded tenders and details, downloading most of the advertised tender documents directly from the site. Agencies are reportedly progressing towards using the electronic tender lodgement service, where suppliers can submit their tenders electronically through *Gem Tendering*, further modifying traditional business partnerships between the public and private sectors (WA Government 2001).

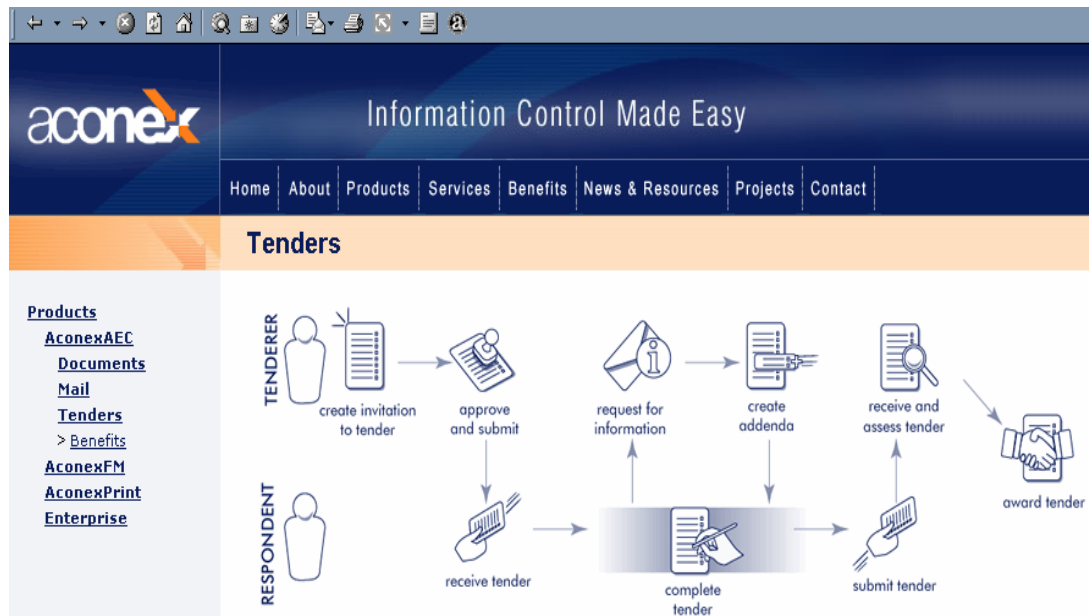
4.1.9 Aconex cxTenders System - Australia, Europe, South America and Asia

Aconex (www.aconex.com.au), with over 2,000 international companies registered and construction and engineering projects in excess of \$14 billion across Australia, Europe, South America and Asia, develops and manages web-based collaboration and information / document control systems, offering a fast, cost effective and easy way for companies to share, distribute, track and archive information. Aconex offer an electronic tendering system called *cxTenders* (Figure 4-18), designed to provide a range of benefits to head contractors, sub contractors, clients, consultants and suppliers, including:

- being centrally stored, tender information can be accessed from anywhere in the world using the Internet;
- the entire tender and tender process is captured in one seamless application;
- reduced internal process inefficiencies and transaction costs;

- improved project control and collaboration between project members;
- reduced errors and increased efficiency;
- lessen document distribution cost;
- increased document control and information tracking;
- reduced double entry and consequential errors;
- reduce the time and cost of tendering - fast, inexpensive submission of tenders; and
- eliminates the need to establish expensive ICT infrastructure.

Figure 4-18: Aconex Tenders Home Page



(<http://www.aconex.com.au/products/tenders.jsp>)

cxTenders key features include:

- tender creation, distribution, response and assessment functions;
- tracking of the tender process;
- invite selected subcontractors – with restricted access;
- customisation of tender templates - including lay-out and logos;
- approval process before tenders are released;
- attach & track controlled documents on both tender invitation and response;
- create and issue addenda - automatically incorporated into response;
- create, issue & collate cascading tenders;
- automatically generate an assessment matrix - price adjustments, scores & weightings to each response;
- accurate and meaningful comparisons of submissions; and
- award tender and notify unsuccessful tenderers.

Aconex describes the *cxTenders* process (Figure 4-18) as follows:

- **Tender creation:** By using the default Aconex tender template, or a template developed specifically for an organisation, the user can complete a Tender Invitation as required. *cxTenders* allows the creator to stipulate fields to which a response is mandatory, the nature of the response required, attach specifications to relevant line items and so on. Attachments such as drawings and specifications are submitted attached to the relevant line items. *cxTenders* is integrated to *cxDocuments* to present the tracking of attachments and tenders.

- **Tender templates:** Tender templates can be customised to an organisation's preference, including layout and branding. Once the base template is set, the user can modify the base as required. The process significantly reduces the amount of time spent creating Invitations to tender and ensures uniformity across an organisation.
- **Respond to tender:** Once an invitation to tender has been received, the respondent can advise the initiator that they are declining to respond. If they do choose to respond, they download or print any attachments and fill-in the required fields.
- **Print Shop for drawings:** If large format drawings are received and the user does not have a plan printer, a request can be sent to a print shop to have the documents printed and delivered via print centres.
- **Addenda:** Once a tender has been issued to the designated recipients, changes must be issued via addenda. The tender creator edits the original and re-issues to the recipients. The respondents receive a notification that the tender has been amended, and their responses are automatically updated to include the changes. These changes will be marked up so that the user is clearly able to see the modifications.
- **Track tender progress:** The user can track the tender response process according to the following stages: "in-preparation", "declined", "submitted", "for approval", "under assessment" or "awarded".
- **View responses:** The tender initiator can view the detail of each of the tender responses individually.
- **Assessment matrix:** In order to assess tenders, the system automatically generates an assessment matrix, which allows the user to compare responses to each field against all other respondents. The assessor can also attribute dollar adjustments, scores and weightings to each item. With automatically calculated adjusted price and weighted total score features, eliminating respondents is simplified. This process reduces the time spent assessing tenders and ensures all relevant information is made available to the tender assessor for well-informed and effortless decisions.
- **Award Tender:** Once the tenders have been assessed, and the appropriate negotiation has occurred (either online or off-line) then the tender can be awarded and the unsuccessful tenderers be automatically notified.

Aconex also realises that education and training is critical for the success of any innovative industry platform, and therefore, at no additional charge, trains project team members to ensure that *cxTenders* is used competently and efficiently. Registered users of Aconex systems can pay a monthly fee to use the range of software applications, which are hosted and managed on Aconex's Application Service Provider (ASP) model servers. Alternatively, registered users may choose to buy the Aconex software and install it on their own hardware, thereby allowing the customisation of software according to their needs, and/or to integrate it with their other computer systems.

4.2 United Kingdom (UK)

4.2.1 ELTON – Suffolk City Council

Suffolk City Council's Procurement and Commissioning department, as part of their commitment to making communication with the County Council easier and faster, have developed *ELTON* (Electronic Tendering Online), thereby allowing the council to issue tenders electronically and companies to submit bids and proposals via e-mail (Figure 4-19).

Figure 4-19: ELTON Home Page



(<http://www.suffolkcc.gov.uk/procurement/elton.html>)

European Union (EU) regulations, Acts of Parliament and the council's own internal standing orders govern the entire tender process, thereby prescribing how the tender is advertised, specified, submitted and evaluated. Most contracts are advertised via the above website, as well as in the local press, trade publications and the European Union (EU) Journal where appropriate. The contract period varies (anything from a one-off tender to over 5 years). Applications for tender documents can be sent by post, email or fax. For contracts over a certain value, *ELTON* will issue a pre-qualification (PQC) questionnaire prior to issuing the invitation to tender in order to save potential bidders, who do not meet the selection criteria, time and effort in completing tender documents. Tender documents are to be completed and returned by the date specified in the document, and any tender received late will not be considered (regardless of when it was sent). Returned tenders (usually via email attachments) are evaluated against pre-determined criteria (usually based on an acceptable level of both quality and price), after which tenderers will receive a letter informing them whether their bid was successful or not.

Additional links on *ELTON*'s home page (Figure 4-19) (eg *ELTON* FAQ and Stages 1, 2 and 3) provide detailed information / rules on how to use the system effectively (*ELTON* 2003).

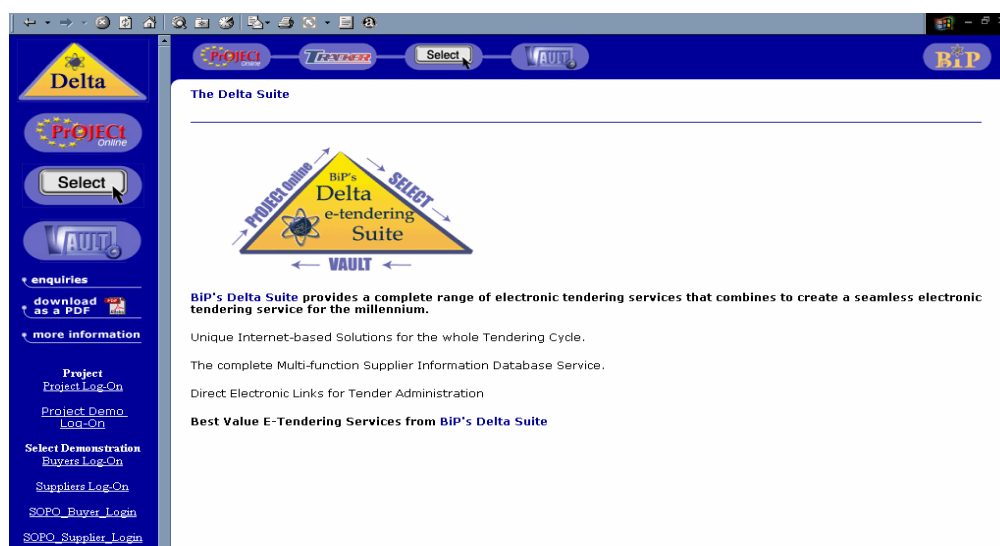
4.2.2 DELTA e-Tendering Suite - Business Information Publications Ltd

Business Information Publications Ltd (BiP) was established in 1984 to facilitate business between the public and private sectors, claiming to be Europe's leading provider of public sector contract information, offering suppliers and buyers access to probably the world's largest database of current open contract opportunities (BiP 2003). BiP is a member of the EU's taskforce for standardising the way in which tender information is created, submitted and disseminated and a leading provider of e-tendering procurement systems, with over 300 UK

government organisations use BiP's internet solutions to create and manage their contract information.

The Office of the Deputy Prime Minister (ODPM) funded 25 Local Government Online (LGOL) Pathfinder projects between June 2001 and June 2002, with the aim of exploring and developing new ways of implementing e-government. BiP reports the Tameside Metropolitan Borough Council (one of 110 local authorities involved in the Government's Pathfinder project) successfully concluded an 18-month pilot of the *DELTA e-Tendering Suite* (Figure 4-20). The pilot aimed at introducing eTendering into the council's procurement process (in line with the Government's 2005 e-agenda), to reduce administration costs and burdens for both buyers and suppliers.

Figure 4-20: *DELTA e-Tendering Suite* Home Page



(<http://www.bipcontract.com/Delta/delta.html>)

Created by BiP, the *DELTA e-Tendering Suite* includes the following three services:



PROJECT Online is an e-notice service used to effortlessly create, manage and transmit contract announcements electronically, enterprise-wide, regardless of location. The service provides the required formats for all types and values of contract announcements, and is widely accessed and used by the public sector (via user ID and password). PROJECT also provides access to the latest legislation, advanced code searches and Contract Notice database.



Many public sector organisations hold data regarding potential suppliers. One of the main difficulties with maintaining this data is keeping it up to date. BiP has developed **Select**, an online supplier information database listing service that provide public sector Buyers with instant access to up-to-date data on pre-registered Suppliers. Select also provides suppliers with the facility to maintain company profiles including the type of data used in the public sector tendering processes. Select is the second module of BiP's *DELTA e-Tendering Suite* of service and connects to PROJECT Online, and VAULT.



Vault provides an internet-based secure tender box facility for Buyers and Suppliers to exchange documents electronically – that is, an electronic e-tendering service that provides the procurement community (Buyers & Suppliers) a secure, cost-effective and easy-to-use e-tendering solution for the transmission, retrieval, storage, receipt and administration of Invitation to Tender (ITT) documentation. VAULT improves the tendering/procurement aspects of ones business, by accelerating the process of document exchange, reducing paper, and increasing security. Buyers and Suppliers receive confirmations of their activities in real time and are able to exchange correspondence in support of the process far more quickly and in a manner that is fully audited. As Vault can integrate with Select, it can also aid Buyers identify additional potential Suppliers. Vault provides the solution for secure electronic competitive tendering and is the final stage of BiP's *DELTA e-Tendering Suite* (BiP 2003; BiP 2003).

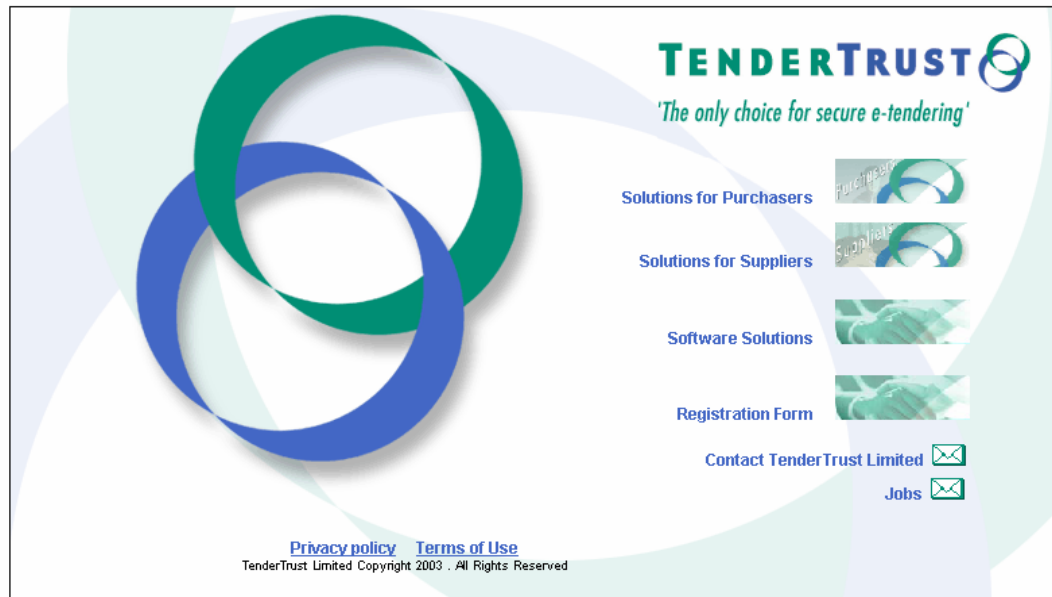
For additional information on the *DELTA e-Tendering Suite* (either from a purchaser or supplier perspective), refer to the various links located on the home page (<http://www.bipcontract.com/Delta/delta.html>).

4.2.3 TenderTrust - UK Office of Government Commerce

In April 2001, the UK Office of Government Commerce (OGC) announced the start of a six-month trial of the online tendering system *TenderTrust* (Figure 4-21). Through this cross-government initiative, it was believed that the new system, if it passes its pilot stage, should produce a savings of about £13 million for the UK taxpayer, and reduce annual tendering costs for suppliers by £37 million (E-Government Bulletin 2001).

In 2001, the *TenderTrust* system was identified as the world's first smartcard internet-based eTendering system. In association with the Royal Bank of Scotland, the system used 'banking strength' digital certificates (Public Key Infrastructure technology and encryption techniques) to meet the highest security and authentication standards throughout the entire tendering process (Byatt I. 2001). As such, the *TenderTrust* system was specifically designed to meet the demanding requirement of both public and private sector tendering, and to assist in removing many of the inefficiencies in traditional paper-based tendering (Gershon P. 2001).

Figure 4-21: *TenderTrust* Home Page



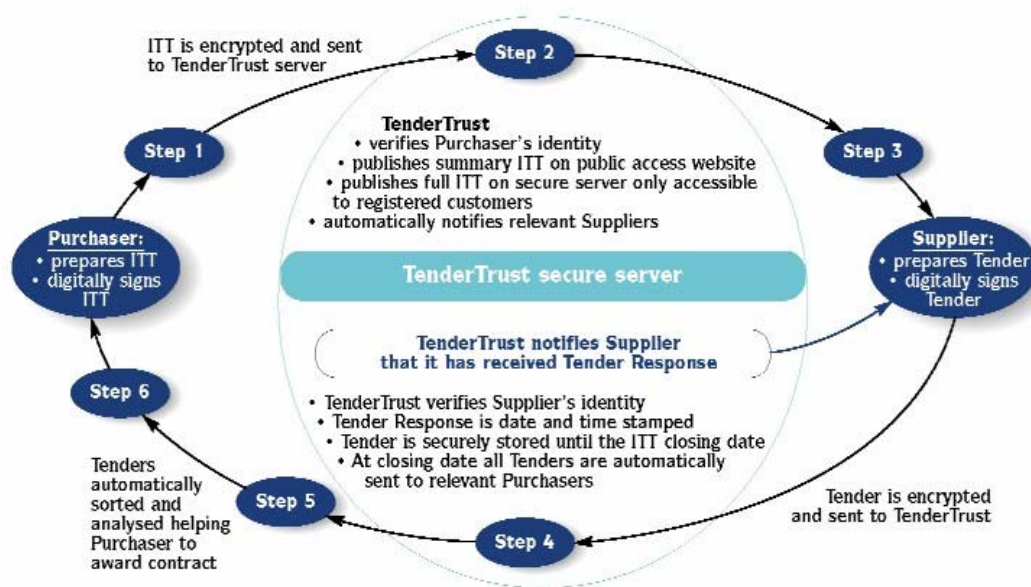
(<http://www.tendertrust.ltd.uk>)

TenderTrust Limited is reportedly a leading provider of fully secure, complete, and end-to-end e-Tendering solution/system (built using already proven technology), whilst offering a wide range of products for use by both purchasing and supplying professionals. The two key and interacting components that make up this powerful e-Tendering system are:

- **TenderTrust:** enabling purchasers and suppliers to manage the entire tendering process – that is, from the creation of the Invitation to Tender (ITT), its publication, through to receipt of tenders, their analysis and award.
- **TenderMAX Pro:** an additional leading edge computer software package specifically designed to meet the needs of procurement, tender and contract evaluation professionals, and said to have the potential to 'revolutionise' procurement decision-making (TenderTrust 2003).

Interestingly, the graphical representation of the *TenderTrust* process model in Figure 4-22 is virtually identical to that of the *Tenderlink* process (Section 4.1.7, Figure 4-15). *Tenderlink* claims to be Australasia's 'first fully automated electronic tendering system' (established in 1994). Yet, with no 'establishing' date documented for the *TenderTrust* system (other than the 2002 Copyright), it is difficult to determine which of the two systems are the true 'originators' of this process model, or if these two are truly separate eTender systems that is, a similar case as the 'shared' use of the *eTender* system (Section 4.1.1).

Figure 4-22: TenderTrust Process Model



(http://www.tendertrust.ltd.uk/content/what_is_tendertrust.htm)

The Department of Health (DOH), one of many UK government agencies involved in the trial of the *TenderTrust* system, stated that the system was “unsuitable” as it was “not networkable” on the department’s server, and that *TenderTrust* required software to be downloaded onto each computer. Simultaneously DOH stated that after a three-month trial period, starting in December 2001, *Vault* (Section 4.2.2 *DELTA e-Tendering* suite) was found to be much easier to run on their networked system. Interestingly, the OGC rejected *Vault* in April 2001, when it decided to select and trial the *TenderTrust* system on its projects. Unfortunately, in April of 2002, the OGC officially announced the failure of its trial of the *TenderTrust* system, because of DOH and other ‘dissatisfactions’. Stating that the system would not be rolled out any further because “the pilot did not fully meet all its operational objectives”. At the time of this announcement, the OGC would not give any further details about the failure or rule out future trials (BiP 2003).

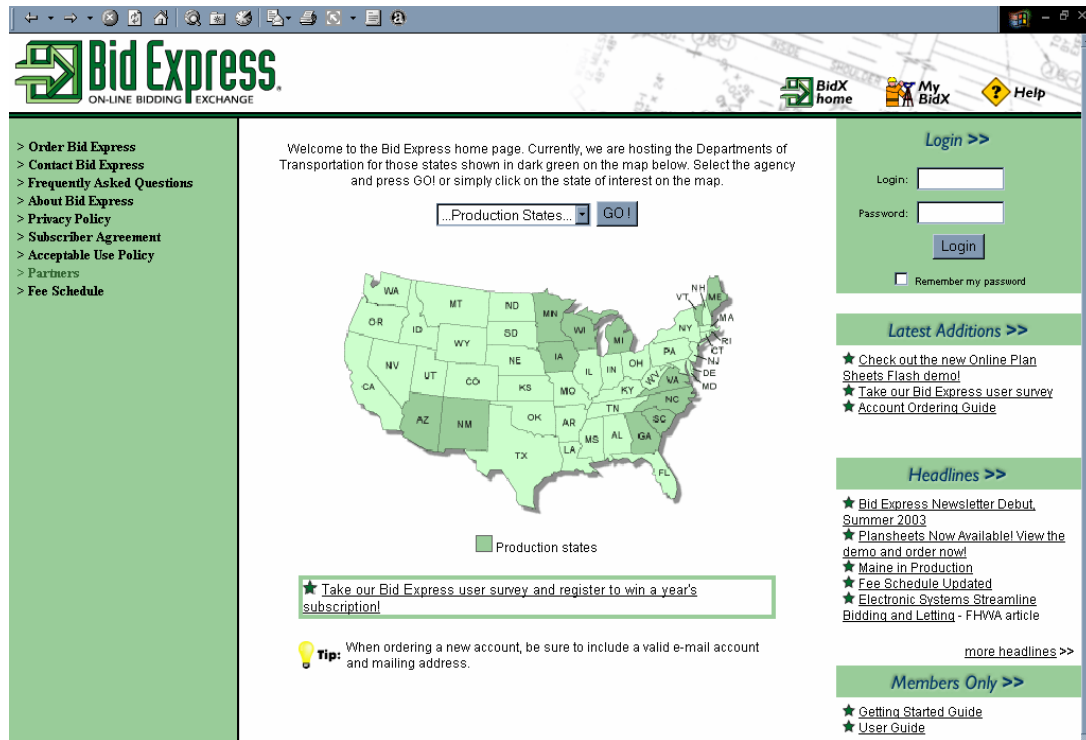
4.3 United States of America (USA)

4.3.1 Bid Express - Department of Transportation

Although not an electronic ‘tendering’ system per se, the *Bid Express* system was included in this investigation due to its unique electronic ‘bidding’ process. *Bid Express* (Figure 4-23) is a web-based bidding information service developed exclusively for the USA highway construction industry to increase the efficiency and accuracy of the existing bidding process – that is, by saving time traditionally required for preparing bids on paper, as well as needless travel time and expense to attend lettings or submit bids in person. *Bid Express* has been in operation for over five years, allowing registered members to scan all current lettings, historical data from previous lettings, and vendor information using a keyword search facility. In addition, members have instant access to lettings from across the country, not just those of their home state. When bidding electronically using *Bid Express*, there is no delay in learning the outcome. This is due to the state transportation agency having the option of posting the results onto the *Bid Express*

web site, as they are being read – that is, ‘real-time’ bid results available within seconds of the bid opening. Contractors also have the flexibility to withdraw or replace their bids at any time prior to opening (Bid Express 2003).

Figure 4-23: Bid Express Home Page

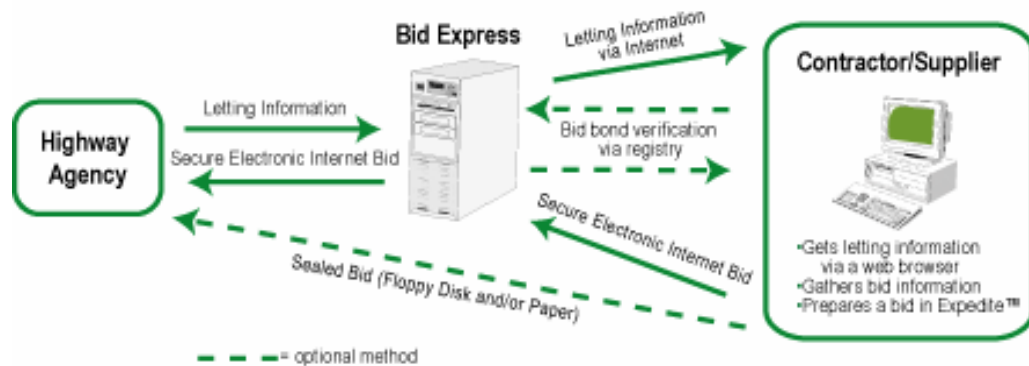


(<http://www.bidx.com/main/index.html>)

Bid Express uses the latest encryption technology (also used by the National Security Agency, the banking industry and Internet commerce) to ensure the bids are safe and secure, thus ensuring all bid files are unreadable by anyone (apart from the state transportation agency), even if intercepted. In addition to file back-ups, duplicate sets of *Bid Express* hardware are located in separate geographical locations using separate internet service providers. Additional *Bid Express* features include:

- user-friendly interface;
- complete schedule of items for each contract, including cost plus time proposals;
- list of planholders;
- bid tabulations;
- plan sheets;
- various download formats;
- one-stop web site for state transportation agency projects on a national level (Figure 4-24).

Figure 4-24: Bid Express Process Model



(Bid Express 2003)

Although *Bid Express* maintains to be a powerful and useful tool on its own, when used in conjunction with *Trns•port Expedite® Bid* (used in bid preparation by 38 state transportation agencies), reportedly can provide even greater efficiency when preparing a bid. Registered *Bid Express* users can download *Expedite Bid* free of charge, and automatically gain access to quantities and simply fill in the unit prices, avoiding costly computation errors. *Expedite Bid* also has an alert function informing users of any blanks or errors during the bid preparation. What is more, when the electronically prepared bid is complete (using *Expedite Bid*), the bid can be submitted over the Internet (using *Bid Express*) in states where two-way electronic bidding has been established and where digital signature technology has been incorporated to provide highest level of security and confidence (Bid Express 2003).

4.4 Canada

4.4.1 MERX eTendering

MERX eTendering is not a government service and is owned and operated by MERX (a wholly-owned subsidiary of Mediagrif Interactive Technologies Inc). MERX is also not funded by governments but rather by its customers through subscriptions and user fees for services including 24/7 bilingual support, low courier rates, and four-hour and turnaround time for document processing. MERX is under a recently extended contract with Bank of Montreal (expiring May 31, 2004) to develop and operate an electronic tendering service (*Merx eTendering*) for the federal and provincial governments.

MERX eTendering (Figure 4-25), defined as Canada's official public-sector electronic tendering service, allows construction industry businesses to have easy and affordable access to billions of dollars in contracting opportunities with the federal government and participating provincial and municipal governments. With billions of dollars in public sector business opportunities tendered annually, suppliers to the government for example, can use *MERX eTendering* to connect to buyers in the federal, provincial and MASH (municipal, academic, school and hospital) sectors to get the information they need to bid on public sector contracts. In addition to having the ability to search for open tender opportunities from the more than 1,500 opportunities available at any time, the *MERX eTendering* service reportedly has a comprehensive document delivery service that maintains high service levels for delivering tender documents.

Figure 4-25: MERX eTendering Home Page

MERX In the Business of Opportunities **ELECTRONIC TENDERING**

Search: [Advanced Search](#) Français Customer Support Feedback

Interested in doing business with the public sector?

Then MERX is your solution! New opportunities are listed daily from the federal, provincial governments and MASH (municipal, academic, school and hospital) sectors from across Canada. Take a look and see if there's an opportunity for you!

Check out what opportunities are open today:

	LISTED	TODAY
Construction		
Construction Services	514	20
Goods		
Aerospace	18	
Air Conditioning and Refrigeration Equipment	4	1
Armament	12	1
Chemicals and Chemical Specialties	26	1
Communications, Detection and Fibre Optics	48	3
Construction Products	55	1
Cosmetics and Toiletries	3	
EDP Hardware and Software	95	9
EDP and Office Equipment Maintenance		
Electrical and Electronics	49	2
Energy	12	1
Engines, Turbines, Components and Accessories	9	1
Fabricated Materials	48	1
Fire Fighting, Security and Safety Equipment	24	2
Food	59	1
Food Preparation and Serving Equipment	13	2
Furniture	19	2
Industrial Equipment	73	
Machinery and Tools	19	1
Marine	17	2

Feature LINK
Find information about online government services.
Canada Business Service Centres are your gateway to government information for business.
www.cbso.org

Subscribe to MERX and SAVE!
Click here to find out how to take advantage of all the MERX features and services and save money!

Did You Know?
Over 80% of MERX customers belong to Small and Medium Enterprises with a workforce of less than 50 employees.

(<http://www.merx.com>)

Although thousands of companies across Canada said to have realised the unlimited potential of doing business with the public sector using *MERX eTendering*, there are still several challenges identified with the Canadian Government committing itself to this single eTendering service. For example, the recent two-year extension of the *MERX eTendering* service was unfortunately accompanied with a 600 percent increase in monthly subscription fees, dissatisfying existing and potential future industry business users (Bray R. 2002). Furthermore, to ensure open and fair competition, most provincial and federal government agencies and departments across Canada (procuring approximately \$8-9 billion in goods, services and construction per year), are required to advertise tender opportunities over \$25,000 via *Merx eTendering*. Yet, most small to medium sized businesses fall well below the \$25,000 scope, and as a result (under the existing federal system) may not be subject to competition, let alone eTendering. This, for example, is the major reason why Nova Scotia does not use MERX and its *eTendering* system (Newman D. 2002).

4.5 Summary

In this section, researchers attempt to determine the construction industry's 'current state-of-play' in relation to e-Tendering opportunities, by examining several Australian and International e-Tender systems (functionality, capability, etc) identified during their investigation. Although most of the e-Tender websites investigated at the time, maintain their tendering processes and capabilities are 'electronic', research shows these 'eTendering' systems vary from being reasonably advanced to more 'basic' electronic tender notification and archiving services for

various industry sectors. Research also indicates an e-Tender system should have a number of basic features and capabilities, including:

- All tender documentation to be distributed via a secure web-based tender system – thereby avoiding the need for collating paperwork and couriers.
- The client/purchaser should be able to upload a notice and/or invitation to tender onto the system.
- Notification is sent out electronically (usually via email) for suppliers to download the information and return their responses electronically (online).
- During the tender period, updates and queries are exchanged through the same e-Tender system.
- The client/purchaser should only be able to access the tenders after the deadline has passed.
- All tender related information is held in a central database, which should be easily searchable and fully audited, with all activities recorded.
- It is essential that tender documents are not read or submitted by unauthorised parties.
- Users of the e-Tender system are to be properly identified and registered via controlled access. In simple terms, security has to be as good as if not better than a manual tender process. Data is to be encrypted and users authenticated by means such as digital signatures, electronic certificates or smartcards.
- All parties must be assured that no 'undetected' alterations can be made to any tender.
- The tenderer should be able to amend the bid right up to the deadline – whilst the client/purchaser cannot obtain access until the submission deadline has passed.
- The e-Tender system may also include features such as a database of service providers with spreadsheet-based pricing schedules, which can make it easier for a potential tenderer to electronically prepare and analyse a tender.

Although post-negotiations for the e-tender process are likely to be in person, research indicates participants often find these meetings to be a lot more focused, due to previous online communications having helped build and reinforce certain productive relationships between those parties involved in the e-Tender process (ITCBP 2003).

Finally, additional tender web sites were identified during this investigation as having particular and various levels of 'electronic tendering' capabilities and functionality, can be viewed in Appendix III.

5 ETENDER SYSTEM - TECHNICAL INVESTIGATION

As a major deliverable for this project, researchers interviewed members of Project Services' *eTender* system's (Section 4.1.1) technical staff, in an attempt to better understand, validate, clarify, and illustrate the system's functionality and capabilities, both from a technical and end-user perspective. As background information, Appendix IV provides a copy of the various issues of interest, circulated by the research team, prior to discussions with eTender technical staff.

5.1 eTender Initiative

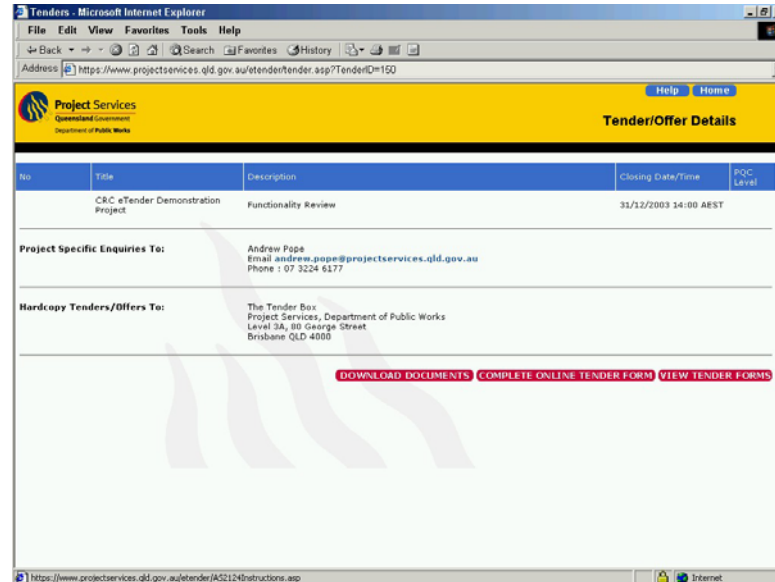
To follow, a broad overview of the features and technical issues associated with an electronic system for tendering building & construction projects - as implemented within Queensland Department of Public Works (QDPW) – identified during the investigation.

5.1.1 Internet and WWW

The Project Services eTender electronic tender system (located at Internet address www.projects-services.qld.gov.au/etender) is designed to allow users to view current QDPW tender / offers; to download tender documents; and to submit tenders via an electronic system. It is a "Web-based" system meaning that it is widely accessible from points across the Internet – via a Web-browser such as Microsoft's Internet Explorer or Netscape's Navigator, which are free for users to download and use. Of course Internet availability in itself requires a connection of some form to an Internet Service Provider (ISP) - through either traditional telephone modem or dial-up, through higher speed services like ADSL and ISDN, or through very high-speed services such as broadband cable. Like many Web-based systems, the eTender system depends upon security settings in the user's Web-browser being modified to accept scripts and "cookies" which assist in managing and tracking user information.

The eTender system currently employs the secure Internet protocol (https://) implemented using the Secure Sockets Layer (SSL) to ensure security and privacy (Figure 5-1). This can be compared with the normal Web (http://) protocol which is not secure and thus could result in communications and information being intercepted or viewed by others.

Figure 5-1: eTender Tender/Offer Details screen



Here users have options either to:

- Download documents,
- Complete online tender form, or
- View tender forms.

5.1.2 Document download

To the user, individual project tender documents appear to be stored by QDPW on a central server, and may range in size from 30Kb or less (for simple text-type documents), up to files in excess of 4 Mb of information for complex drawings and images. For each project on the eTender server, a list of that project's documents is maintained and made available - allowing users to view and download further information.

Users are provided with brief details such as type; description; file name; size (in Kb) and view or download options, for each tender document. The documents may be viewed or printed on-line across the Internet, or alternatively may be downloaded to a user's machine where they can then be printed or viewed locally at any time. To allow users to read and print a range of tender documents, the eTender system makes use of widely available "Web-browser plug-ins" - which is free for users to download and use - such as:

- Adobe Acrobat - to read/view .pdf document files
- AutoDesk VoloView - to read/view .dxf/.dwg CAD drawing files
- AlternaTIFF - to read/view .tif graphics files

5.1.3 Document viewing

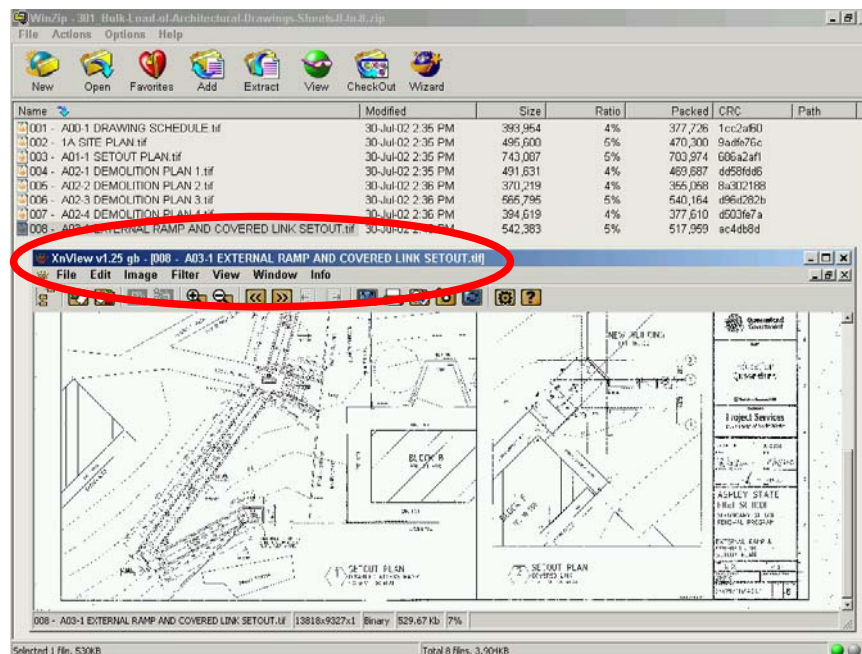
Following downloading, a .pdf file may be viewed from the users PC using the Adobe Acrobat "plug-in" for Internet Explorer. Acrobat allows "bookmarks" to be placed throughout the file, thus providing users with easy access to different parts of the document. As well, the Acrobat plug-in allows users to "zoom-in" and easily enlarge parts of the document, or simply to easily print any part, or all, of the document - in this case, the document consists of 315 printed pages of detailed specifications.

Importantly users are not required to have proprietary software in order to easily access the QDPW documents, nor to respond to the tender invitations. That is, the use of such tools /

plug-ins means that users do not have to purchase their own licensed copies of proprietary (and often expensive) software such as Microsoft Word, AutoCAD, etc. in order to view and print the eTender documents.

Another document management tool known as WinZip is widely used for file compression to produce smaller file sizes. The eTender system employs WinZip to both combine related files and to compress (particularly graphical) files for faster downloading. These files are also easily opened by the user with the correct IT tools, and once again can be viewed with appropriate viewing tools. In the case shown in Figure 5-2, a graphics viewer, known as XnView, allows users to preview and display / print any of the eight graphical files contained within the “Architectural Drawings” file named as “301_Bulk-Load-of-Architectural-Drawings-Sheets-0-to-8.zip” which is some 3.7 Mb in size.

Figure 5-2: WinZip file contents and graphics viewing

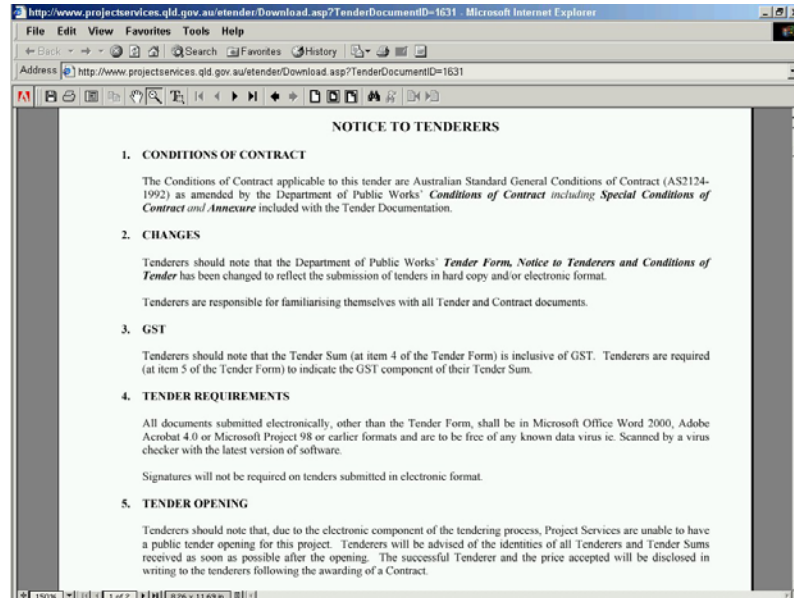


The top window displays details of the contents of the eight (8) files contained within the .zip file, while the lower window displays the contents of the 8th graphics .tif file. Again, commonly used graphics tools such as XnView allow the user to zoom in or out to enlarge or reduce the graphics image for clarity or context. The degree of clarity, which can be maintained, is a function of the scale or resolution that the original drawing has been scanned in at – the higher the resolution or scale, the larger the file-size produced, and hence the longer the file takes to download across a network. Therefore when creating these files for the eTender system, expertise is required to balance these factors against one another, and ensure clarity is retained but not at the expense of inordinately large files with correspondingly long download times.

5.1.4 Notice to tenderers

Again, the Tender Document Notices are held for downloading in Adobe Acrobat format for ease of viewing and printing (Figure 5-3).

Figure 5-3: Viewing Acrobat file within browser



The eTender system uses e-mail to notify tenderers of any addenda to a Tender, in addition to acknowledging receipt of the Electronic Tender Form and associated documents. It also uses e-mail for providing acknowledgment of all documents submitted by tenderers.

5.1.5 On-line tender form

After logging on to the eTender system, users can key-in information to complete the Electronic Tender Form – however after 20 minutes of no activity, the user is automatically logged off to help ensure security. Users must verify items such as Tenderers name, address, and contact details, as well as others details shown in Figure 5-4.

On the Electronic Tender Form (ETF), users must also enter items such as Tender Sum (in words, and in figures), GST component, and Net Sum., and provide an address for the service of notices. Additionally, tenderers are required to acknowledge any addenda and to specify which (if any) are not included in the price.

Figure 5-4: Electronic Tender Form details

AS2124 - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <https://www.projectservices.qld.gov.au/tender/AS2124Step1.asp>

Project Services
Queensland Government
Department of Public Works

Help Home

Tender Form Details

Tender CRC eTender Demonstration Project Functionality Review

Tender/Offer Details

Tender Form - Lump sum using AS 2124-1992 Conditions of Contract

(1) and (2)

Address for lodgement of Tenders (1) Hardcopy Tender The Tender Box
Project Services, Department of Public Works
Level 3A, 88 George Street
Brisbane QLD 4000

(2) Electronic Tender Project Services Electronic Tender Box

Time for close of Tenders 2:00:00 PM on Wednesday, 31 December 2003

(3) Tenderer

1/We Crawford Carpenters
of (Address) 3 Nail Street
Melbourne Vic 3000

PQC Registration No 000

QB5A Licence No 00000

ABN 00 000 000 000

Facsimile

Next

To remind eTender users that they are accepting the onus for their information transmission and security, QDPW stresses in Section 12 of the Electronic Tender Form that:

... "By submitting a Tender, the Tenderer acknowledges and agrees that Tenders for this project may, in part be submitted in an electronic format. The Tenderer further acknowledges and agrees that Tenders submitted in an electronic format may not be information secure and the Principal has given no undertakings whatsoever in respect of confidentiality of information submitted in an electronic format. The Tenderer releases and forever indemnifies the Principal from any claim, of any nature whatsoever, in relation to security of information submitted in electronic format. The Tenderer acknowledges and agrees that Tenders submitted in an electronic format are done so at the entire risk of the Tenderer."

As well as providing on-screen confirmation, as indicated previously, the eTender system uses e-mail to acknowledge receipt of the Electronic Tender Form and associated documents. It also uses e-mail for providing acknowledgment of all documents submitted by tenderers.

5.2 eTender Technical Issues Discussed

Discussions with QDPW / Project Services technical staff responsible for eTender developments resulted in the following elaboration of the technical issues - which were this investigation's primary focus.

5.2.1 Background

- Each consulting or contracting firm on the Queensland PQC Register¹ of Pre-Qualified Contractors has a unique PQC number plus an Australian Business Number (ABN), and

¹ The PQC System provides a comprehensive central register of pre-qualified building industry contractors and consultants, used by all state government departments. Only building industry contractors on the PQC Register from 1 May will be eligible to tender for government building projects valued at more than \$250,000.

together these items are utilised to identify firms as valid users of the Queensland Department of Public Works (QDPW) eTender system.

- Industry Policy Division of QDPW oversees the PQC Register or lists (currently held in a Lotus Notes-based computer system) which are used as a master reference, but the lists will be interfaced more directly to the eTender system in Phase II of development.
- Currently, Building Division policy specifies that only firms with a PQC Rating of Level 2 and above are eligible to participate in the eTender system.
- Each Tender has a QDPW tender Project Manager (PM) who manages the Tender process including initially deciding which firms on the PQC list are invited to tender :
 - *Select Tenders* – open only to selected tenderers, and
 - *Open Tenders* – open to any tenderers on the PQC list.
- Presently there is *potential* for discrepancies caused by time lags between updates made to PQC lists and their uses made in the eTender system — although each Tender Project Manager would usually resolve any differences prior to using the PQC list of candidate firms.
- eTender users retain the option of submitting “hardcopy” (i.e. paper-based) responses for eTender jobs, however this option has not been used much by clients since the introduction of the current eTender system.
- However, QDPW currently still undertakes a number of “hardcopy-only” tenders as deemed necessary and appropriate.

5.2.2 Security

- There is a nominated, continuing, primary e-mail contact within each firm on the PQC list, and other e-mail contacts can also be added or specified by the firm. However, as an eTender system security precaution, whenever a secondary user within a firm is detected accessing eTender information, the system routinely notifies the primary e-mail contact also.
- Each eTender system password is specific for that Tender and “one-off” for an individual firm, thus if staff leave the firm and take knowledge of passwords, etc. the current password cannot be used to access information on further future tenders. Furthermore, a tenderer’s password only remains current until the date that the tender closes – i.e.: Contractor tender processes typically last 3 weeks and Consultancy offer processes typically last one week..
- Whilst a Tender remains open, if an e-mail regarding the Tender is sent to a nominated e-mail contact and it “bounces” (that is, the e-mail is returned with addressee unknown), then the PM for that Tender would normally fax or telephone the intended recipient and then make corrections to the e-mail address if it is in fact incorrect.
- QDPW advises that for audit trail purposes, normal logging of all user access to the eTender Web-server is available for perusal should it be necessary. They also advise that a standard level of back-up procedures for eTender documents are in place, with routine archiving taking place after two years of on-line storage.
- Once the eTender period closes and following evaluation by a Selection Panel and formal tender approval, the Project Manager would normally send out four (4) hardcopy plus one electronic copy (on CD) of the full documentation to the successful tenderer.
- Letter of acceptance is when the Tender is verified, and the contract becomes valid when hardcopy of the contract has been signed.
- The eTender system is housed on “dual, mirrored server” hardware (ensuring minimal downtime should one server fail or ‘crash’ for any reason), and is based upon Microsoft software. The eTender system utilizes Microsoft’s IIS Web-server, SQLServer database software, and the ASP (Active Server Pages) approach to Web-serving.

Key trade and specialist contractors may also need to be registered on the PQC System if a separate project component - or trade package - exceeds \$250,000. All building industry consultants must also gain PQC registration to be eligible for commissions on government building projects. A review of building industry consultants' PQC registration is due to begin mid-year. The PQC System does not apply to infrastructure projects such as roads, rail tracks, dams and bridges.

- Microsoft's IIS (Internet Information Services) software is used as the eTender Web-server software since QDPW is for the most part a 'Microsoft shop', and maintains substantial expertise in various Microsoft products in addition to IIS.
- For added security against interference and hacking, all eTender documents are "streamed" to the server address rather than being made available to the user directly from the Web-server.

5.2.3 Network issues

- QDPW currently utilizes CITEC² as their Internet service and network provider for the eTender system, however since CITEC manages the network including connections to the eTender system end-users, unfortunately it is currently not possible for QDPW to identify whether the customers access to eTender is coming via telephone modem dial-up, ADSL broadband, or via broadband cable.
- To date, most tenders released via the eTender system have resulted in low numbers of submissions (typically in the range 1–10), hence no problems or bottlenecks at peak tender submission times have been reported, but are also not expected in future. However, it should be borne in mind that users can also lodge additional documents as well as the Tender Form, and the size of these accompanying attachments could have some influence on the speed of uploading information from the tenderers to the eTender system (thus a *potential* problem for users, but not necessarily for QDPW).
- There are few, if any, reported bottlenecks with either downloading of eTender documents or uploading of Tenderers information, or the on-line completion of the Electronic Tender Form. It should be noted that if the eTender system is unavailable for some reason at a key period in the Tender process, it is within each tender Project Manager's capacity (after consultation with his manager) to grant an extension to the Tender time to take account of the system unavailability.
- The Electronic Tender Form is a reasonably straightforward one, and thus should interruptions to transmission occur while the Form is being completed, then the user could re-key the tender details again if the system is unable recover the partial information.

5.2.4 Document management

- Often architectural drawings and detailed CAD plans may be necessary to supplement the textual information for the Tender, and these are routinely converted to suitable files (.tif) by a service group within QDPW (ePlan staff). Those files are then returned to the relevant Tender PM to lodge on the eTender Web site - along with any other documents that then comprise a complete package of Tender documentation.
- At this stage of eTender implementation, only e-mail (or fax, or telephone call) is used to formally communicate with the eTender customers (that is, not SMS messages, etc.).
- Under advice from their Legal and Contractual Group, QDPW staff operate on the principle that the information held on the eTender Web-site is the definitive set of documentation for each Tender, and should the information be altered or corrupted by potential users or factors in the downloading process then QDPW should not be held responsible for that.
- If alterations to the Tender are found necessary, then the original eTender document version is not amended, but rather an Addendum or full (amended) document is reissued. Users are formally notified of the issue of such an Addendum, and in fact are asked to acknowledge in the Electronic Tender Form the receipt of any such Addendum.

² CITEC is a national Information and Communications Technology (ICT) service provider that, as a fully commercialised business of the Queensland Government, services both government and private business clients.

5.2.5 People issues

- On-line “help files” for the eTender system are HTML-based, and thus can be viewed and navigated by most common Web-browser software such as Microsoft Internet Explorer and Netscape Navigator. As well, an on-line tutorial and eTender start-up guide are available for users.
- QDPW maintain a “Help Desk” staffed by Information Technology (IT) Branch during normal office hours to support their own staff, and this is used to log and assist simple queries from eTender clients, while more complex queries are logged by IT but passed across to eTender personnel to deal with. In addition, the PM responsible for each Tender is available by e-mail or telephone to assist users with specific queries regarding his/her Tender.
- Informal feedback to QDPW from users reportedly reveals a fast-growing acceptance of the eTender system, although it is also clear that many of the current users are larger companies with an adequate level of expertise in the use of ICT already within their business. Very little evidence is thus far available regarding the experience of smaller enterprises with the eTender system.
- As a policy, the responsible Project Manager cannot view the completed electronic Tender Forms until after the closing time and date for the Tender. This is typically around 2pm, allowing Project Managers to initiate the formal ‘paperwork’ or Tender Evaluation Form for the Selection Panel before the close of business the same day.

5.2.6 Future developments

- The system at the heart of the QDPW eTender system is also being used to ‘power’ the broader State “Queensland Government Marketplace” electronic whole-of-government tender system. This should result in additional client feedback on the system being available sooner than otherwise would be the case for the QDPW eTender system operating in isolation (www.projects-services.qld.gov.au/etenderqgm/Default.asp).
- Currently some larger firms copy the tender documentation to their own Web-site to then make it available to smaller subcontractors, but this approach could result in any subsequent changes to the Tender documents or details perhaps being overlooked for those smaller contractors. Phase II of eTender development provide a tenderer who is eligible for a specific tender, with a secondary password that can be passed on to sub-contractors and contract printers. This secondary password will enable the user to access the published tender documentation for the specific tender, but will not enable the user to submit a tender.
- Phase II will also incorporate closer integration of the PQC Register with the eTender process since the PQC re-development is being undertaken by the group within QDPW who have responsibility for the eTender (and Queensland Government Marketplace) system.
- It is also planned to include a Tender Evaluation module into the eTender system as part of Phase II of the system’s development. This will assist PM’s and the Selection Panel in rapidly and objectively assessing various elements of the eTender project’s suitability (e.g. compliance with certain requirements; local business inputs, workforce, etc.).

5.3 Summary

- The eTender system of the Queensland Department of Public Works (or Project Services) has been made available on a restricted scale, and is already being used successfully by a number of (medium-sized) firms in the Building and Construction industry.
- Similarly, to other on-line systems, eTender’s advantages over the traditional paper-based approach hinge on the ease with which a Tender Project’s plans, drawings, specifications, schedules, etc. can be made widely available. Consequently, any qualified contracting firm

can download and view the “information package” of Tender documents at any convenient time, as well as having the option of subsequently lodging the firm’s response to the Tender easily and electronically (with or without adding any accompanying response documents).

- The eTender system’s levels of security and availability / reliability appear in line with commercial expectations, and the developments planned for Phase II will remedy any (minor) concerns that may arise from the current system’s implementation. The concurrent development of the whole-of-government electronic marketplace system (based largely on the eTender ‘engine’) should also (hopefully) ensure that sufficient IT resources are made available to promote rapid on-going development and deployment. However, this should not be at the expense of any eTender requirements that may be thought essential for its rapid uptake specifically within the building and construction industry.
- As the eTender system becomes more widely used and its accessibility permeates through to the smaller building and construction firms, in common with many on-line systems, issues may well arise relating to the education and training of potential eTender users, and the ready (or otherwise) availability of technical assistance - although commercial entrepreneurs may take up the training and assistance opportunity.
- In addition, there are (inadvertent) effects caused by CITEC acting as an intermediary between the eTender system and the end-user, meaning that QDPW does not have knowledge of those clients’ methods of connecting to the system. This means there *may* be some danger of the system development being focussed on the larger users who have good network connections in place.
- It seems a little early in development to assess yet whether smaller firms (with less IT resources or in-house skills), plus those in more “remote areas” that are less well served by high-speed Internet access, are able to use the eTender system to their complete satisfaction, but for the bulk of other users the system is emerging as a major step forward.

6 E-TENDER BENEFITS

A significant number, and in many cases similar e-Tender benefits were identified during this investigation, with industry and Government participants generally stating that an e-Tendering process is cheaper and faster than the previous paper-based process (B&C Watch 2001). The primary benefit government agencies, service providers, and industry seek to achieve from implementing electronic procurement (e.g. e-Tender) is to reduce the cost of doing business and to deliver services that are more efficient to the community. As mentioned in earlier sections of this report, e-Tendering is a key strategy in the development of various electronic procurement programs and initiatives, offering additional opportunities for industry businesses, contributing to a globally competitive economy, and helping secure a sustained economic growth. According to the NSW Government (NSW Government 2002) and Department of Commerce (NSW Government 2003), the construction industry and government agencies / departments can achieve numerous benefits from introducing an e-Tendering system or process, including:

- **General:**
 - streamlines the whole tendering process;
 - provides improved and secure access to tender information;
 - brings about innovative business processes;
 - initiates greater opportunities for small and regionally based businesses;
 - allows downloading of electronically submitted tenders in a form suitable for evaluation purposes without having to manually re-enter data; and
 - makes it easier for businesses to obtain tender documentation and to submit an offer on time.
- **Industry perspective:**
 - provides quick and easy access to public and private tendering information;
 - increased tender opportunities;
 - improved access for geographically isolated industry organisations;
 - increased market share and competitiveness; and
 - reduces the cost of printing - saving time and resources.
- **Government perspective:**
 - best value for taxpayers' money;
 - increased efficiency and effectiveness;
 - consistent tendering practice across Government;
 - promotes overall e-Commerce initiative; and
 - environmentally friendly due to a predominantly 'paperless' process.

From an International perspective, United Kingdom's (UK) Office of Government Commerce is one of many key clients spearheading the adoption of e-Tendering (ITCBP 2003). 'Construction Industry Trading Electronically' (CITE), launched in April 1995 as a collaborative initiative to create an open trading community for the UK construction industry (CITE 2003), and 'Information Technology Construction Best Practice' (ITCBP) (ITCBP 2003) identifies a number of benefits its construction industry members realise when adopting an e-tendering system or process, including:

- the cost of preparing, copying and distributing tender documents could be cut by up to 90%;
- the time to import tender document data into estimating software is reduce from days to minutes;
- avoids duplication of data interfaces;
- faster turnaround of tender documents;
- improved accuracy during tender analysis - faster reporting;
- information supplied to tenderers is consistent;

- tenders are always legible;
- there is less likelihood of missing the tender deadline;
- faster distribution of tender information;
- improved security;
- tenderers who are based further away are not disadvantaged;
- there are improved communication and audit trails;
- less time is spent on routine administration;
- better management information is provided;
- there is no need for paper copies;
- the standardised electronic format makes the comparison of bids more straightforward; and
- the process is transparent and open.

6.1 Summary

The efficiency of an e-Tender process seems well supported internationally, with a significant number, yet similar, e-Tender benefits identified during this investigation. Recognised as being in the forefront of e-tender adoption in the UK construction industry, CITE verifies the annual costs to clients, having to produce, copy and distribute tender documents the old fashioned way (that is, on paper), can be cut by as much as 90% using an e-Tender process. Australian construction companies like Thiess have now joined other major contractors and project developers in supporting CITE's e-Commerce initiatives, to help extend the operational use of electronic business and development of electronic structured data standards (including eTendering) across the entire construction industry (Thiess 2003).

Although branded in some industry circles as an electronic 'Dutch auction', many disagree. According to (McCrea A. 2002), tendering online is here to stay and seen by many large industry players as an important tool in the future of procurement. Therefore, if clients can persuade their main contractors and subcontractors to tender online, analysts have identified the potential savings of up to 15% at every level in the supply chain, which may be enough for construction clients to choose online tendering / bidding over other forms of procurement

Both construction industry and Government participants generally agree that the implementation of an automated e-Tendering process or system enhances the overall quality, timeliness and cost-effectiveness of a tender process, and provides a more streamlined method of receiving, managing, and submitting tender documents than the traditional paper-based process.

7 E-TENDER CHALLENGES

Whilst there are undoubtedly many more barriers challenging the successful implementation and adoption of an e-Tendering system or process, researchers have identified the following range of challenges and perceptions that seem to hinder the uptake of this innovative approach to tendering electronically.

7.1 General

Whilst the electronic exchange of data within the construction industry is becoming increasingly more common, certain contractors and consultants see the use of an e-Tendering process as 'unfair practice' if they are not in a position to take advantage of receiving or sending tender documents electronically. This issue can easily be resolved by offering tenderers the option of receiving their tender documentation in either paper or electronic format (CITE 2003).

A further two principal barriers to tendering electronically have also been identified (CITE 2003). Firstly, certain consultants perceive e-Tendering as being of more use to contractors than to themselves. Secondly, even though increasing number of contractors are capable of, and encouraged to return their tender bids electronically (even when the initial tender documents were received in paper format) the majority of contractors and consultants have yet to adopt the e-Tendering process. Both these barriers, according to CITE, can be overcome through increased efforts in highlighting the potential benefits and opportunities available to contractors, consultants and clients, when adopting an e-Tender process. Therefore, to help achieve this increased knowledge and awareness within the construction industry, researchers suggest the developers, owners and managers of these e-Tendering systems and processes need to hold regular public e-Tender information dissemination programs, which in turn will help fuel their uptake.

7.2 Employment

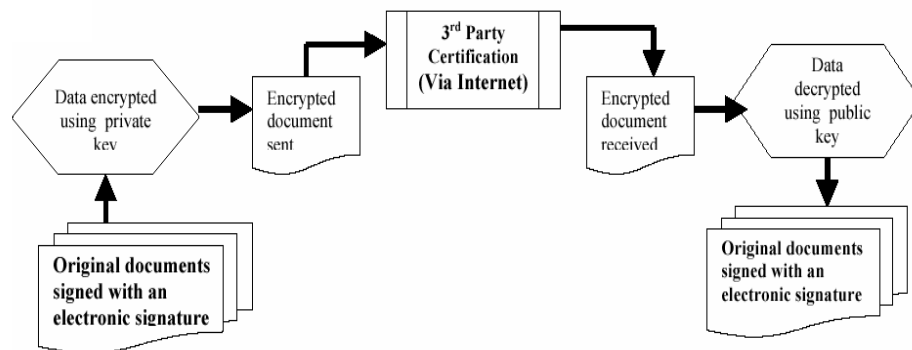
The perceived impact an e-Tendering process may have on existing contractor and consultant employment prospects could raise some level of concern. However, it is believed that the electronic exchange of tender documentation allows staff to use more of their valuable skills on 'profitable' tasks and less time on administration work. This in turn has the effect of 'empowering' employees, providing increased value to their employers and projects, thereby improving the overall service to their clients (CITE 2003).

7.3 Security

Research indicates that 43% of Australian government organisations with access to the Internet identify 'security' as a major limitation to the greater use of the Internet (ABS 1999). Yet in reality, according to CITE, the electronic exchange of information and data is probably more secure than the use of paper (CITE 2003). CITE's Legal & Security Issues Group, for example, are currently piloting and evaluating the use of electronic signatures and various data encryption technologies, in an attempt to offer maximum security to project partners when exchanging data electronically (Figure 7-1). CITE describes an 'electronic signature' as being '*derived from a human signature, which can be generated using data capture via a digitiser or tablet (also known as a biometric token)*'. This electronic signature is then '*embedded into a document*',

thereby confirming the 'originator' signed the document and that the content of the document has not altered in any way.

Figure 7-1: CITE's Electronic Signature Pilot



(CITE 2003)

In Australia, Queensland based 'e-Security' businesses are identified as being 'leaders' in research and development (R&D) capabilities. Described as:

- having the largest e-Security research community in the southern hemisphere;
- being the second largest cluster of e-Security companies in the world;
- being supported by a world class research infrastructure;
- having highly skilled e-Security workforce;
- having low operating costs, low taxes, low cost of living, and low R&D costs;
- being in close proximity to Asia-Pacific markets;
- having a high availability of multilingual workforce; and
- being globally competitive (IIB 2002).

7.4 Legal

There also seems to be a growing concern regarding certain formal contracts not making explicit reference to future / ongoing use of electronic data exchange. This is because project participants (contractors, consultants and clients, etc) still perceive 'important' communications taking place 'in writing', and not having a clear understanding as to whether electronic communications (eg using an e-Tendering system) will 'legally' suffice (CITE 2003).

To help overcome these important legal and contractual issues, which have become central to any electronic communication or transaction activity on today's projects, the Australian (and Queensland) Electronic Transactions Act's main objective, for example, is to provide a regulatory framework that:

- recognises the importance of the information economy to the future economic and social prosperity of Australia;
- facilitates the use of electronic transactions;
- promotes business and community confidence in the use of electronic transactions; and
- enables business and the community to use electronic communications in their dealings with government.

In this case, the above Act defines 'electronic communication' as:

- 'a communication of information in the form of data, text or images by guided or unguided electromagnetic energy'; or
- 'a communication of information in the form of sound by guided or unguided electromagnetic energy, if the sound is processed at its destination by an automated voice recognition system'.

The Act also states that 'a transaction is not invalid under a State law merely because it took place by one or more electronic communications'. That 'the purported originator of an electronic communication is bound by it under a State law, only if the communication was sent by the purported originator or with the purported originator's authority'. Furthermore, the Act states when a person's signature is required, then the legal requirement for an electronic communication is met, if:

- the 'method' used identifies the person, and indicates the person's approval of the information communicated;
- this 'method' was as reliable as was appropriate for the purposes for which the information was communicated; and
- that the person, who required the signature, consents to using the above mentioned 'method' (Commonwealth Government 2001; Queensland Government 2001).

Similarly, CITE aims to define a framework for legal conditions and contracts, regarding the use of electronic exchange of information in construction-based e-business. Their goal is to provide a legal framework to regulate the new electronic ways of working for all parties involved in a project (CITE 2003).

7.5 Summary

Several e-Tender 'challenges' have been identified in this section. A central concern seems to be that of security - when industry organisations have to use the Internet for electronic information transfer. As a result, when it comes to e-Tendering, industry participants insist these innovative tendering systems are developed to ensure the utmost security and integrity, and rightly so. Yet, some researchers find it ironic that the industry's trust seems to be 'more biased' towards telephone calls rather than to transferring documentation or information electronically (e.g. via email, Internet, etc.). Claiming that, in basic terms, electronic transfer of information is no more (or less) secure than the conventional telephone call, due to, for example, email messages being routed between Internet service providers, and over public telephone networks (Anumba C.J. and Ruikar K. 2002).

Nevertheless, information security (e-Security) is about protecting electronic assets, where information security and data protection complement each other, even though sometimes considered different – that is, data security is an important part of data protection, where as information security focuses on personal data. Determining how to make data safe is only one aspect of e-Security. Equally important is ensuring the quality and accessibility of data in relation to 'three information security model elements':

- **Confidentiality**: ensuring that information is available only to those who are authorised or entitled to see it;
- **Integrity**: ensuring that the information is accurate, complete and not corrupted; and
- **Availability**: ensuring that the information is accessible when required (Cabrera A., Cabrera E.F. et al. 2001).

8 E-TENDER TRENDS AND RECOMMENDATIONS

8.1 Risk

When it comes to industry professionals choosing electronic communications via an e-Tender process or system, the potential legal risks in using such a system or process are directly proportional to the increasing levels of electronic interaction. Three e-Tender risk categories have been identified during this investigation, namely:

- **Category 1:** Where tender information is simply posted on the internet as 'pure information'.
 - **Recommendation:** Although exposed to minimum levels of risk, attention must be given to its contents – that is, truth, accuracy, not misleading or defamatory, etc.
- **Category 2:** Where the e-Tender web site claims to have tender related information that tenderers need to rely on and perhaps download.
 - **Recommendation:** In this case, owners or managers of the e-Tender system are to spend more time ensuring that what is on their site is complete, accurate and true. The inclusion of a 'non-reliance' exclusion clause may also be necessary. Ensure the tender documentation can in fact be successfully downloaded (in its entirety), especially if tenderers are asked to reply in hard copy format.
- **Category 3:** This is at the top end of the 'risk scale', having a fully interactive internet-based e-Tender system, where tenderers both receive an invitation to tender, and reply with a tender bid electronically – that is, with no option of obtaining a paper copy of the tender documentation (except by printing out the contents of the web site).
 - **Recommendation:** In this case, security of information and integrity of the e-Tender system is of paramount importance. Here, legally binding and enforceable contracts are being formed electronically, leaving little room for error in receiving, sending, or storing the information. Furthermore, as owners or managers of the e-Tender system, they are unable to simply exclude all liability for what could happen during an electronic e-Tender process, and will likely have to assume some of the unforeseen risks (especially when an electronic reply is the only option) (Worthington R. C. 2002).

8.2 Competitive Tendering

Research indicates increased activities in the use of 'competitive tendering', described as having the unique ability of achieving increased economic viability, whilst boosting industry competitiveness and minimising risk. Large international coal companies in Korea, for example, with suppliers from all over the world (including Australia, Canada and South Africa) no longer simply renew their existing long-term contracts when they expire, and utilise the competitive tender approach instead. Competitive tendering aims to promote fair and open competition so that the best value for money can be obtained, whilst applying three key principals:

- ensure the competition process is witnessed and conducted in a fair and transparent manner;
- that clear procedures are adopted for evaluating tenders to ensure the required quality can be achieved; and
- to act fairly among potential contractors (equal opportunity) to ensure no tenderers are disadvantaged.

The main purpose of tendering competitively, in this case, is to obtain the lowest price in the open market under given situations. The more competition among tenderers, the better results achieved. Of course, there is still the 'trade-off' between the lowest price and quality / performance of service or product (Chang-Sup J. 2002).

Similarly, reverse bidding, being an adoption of the traditional non-electronic practices in certain markets, allows industry clients or 'buyers' to electronically source and secure the minimum price of comparable products or services through competition (Plasticsahead.com 2003). The Australian Procurement and Construction Council (APCC), for example, are currently developing guiding principals for the use of online and reverse / competitive bidding in government procurement (APCC 2002)

8.3 Training and Education

Whilst this report is written in 'plain English' and without the use of too many technical terms and phrases, many have become 'buzz-words' in certain industry circles over the past decade (The Construction Confederation 2001). The term e-Tendering, for example, is one of many technical jargons that could act as a deterrent for many when given the opportunity to adopt an electronic tender process, simply due to lack of understanding or misconception.

In an attempt to help increase today's construction industry participant's uptake of innovative technologies, systems and processes (such as e-Tendering), it is strongly recommended that construction organisations become learning organisations. Due to the increasing 'electronic integration' of construction processes, industry participants have no choice but to acquire themselves a complete range of new skill sets, and to 're-think' the way current construction education is organised in delivering these skills, thereby implying a need for 'cross-disciplinary education' (Foresight 2000).

There is also a significant role for tertiary education to develop and support the understanding of how to accept, evaluate and implement technological change and innovation. This provision is required both in undergraduate / postgraduate courses to create a more receptive and able cadre of construction professionals (including the creation of a more common understanding) (CRISP 2000). Benefits to be gained from investing in improving the skills and knowledge of employees include (Foresight 2000):

- highly trained and motivated workers leading to more successful firms;
- better training will raise industry standards and improve employment prospects;
- a healthier and happier workforce;
- an improved image for the industry and attraction of more skilled people;
- research and development has long-term economic gains;
- an innovative environment that will stimulate and create more and better ideas;
- more flexible use of multi-skilled people; and finally
- a high-tech image delivering improved social benefits will make the industry more attractive as a career for young people.

8.4 Improved Implementation

When it comes to the implementation of an e-Tender system, 'Information Technology Best Practice' identifies a number of basic recommendations, including:

- Having an extremely robust and secure e-Tender system - by having an enhanced security policy in place and by carrying out regular security "health checks" on the system itself and its users
- Ensuring confidential information cannot get into the wrong hands – for instance:
 - Whilst many aspects of an e-Tender process are similar to traditional tender arrangements, there are certain legal issues (possibly contractually binding issues) that need special consideration - for instance, people often let work colleagues check their

email inbox, allowing 'unrestricted' access to dedicated e-Tender system usernames and passwords.

- Clarification of certain 'grey areas' regarding timing of electronic tender documents – that is, the need for an e-Tender system to automatically generate and archive dispatch and receipt times of electronically distributed/submitted tender documents.
- Providing accesses to advanced capabilities within the system - for instance, allowing one to compare data from project to project in order to view relative prices and timely decision-making.
- Allowing the reuse of standard information of regular tenderers - for instance, storing the pre-qualification documents and information of a regular pool of tenderers.
- Tender terms, conditions, application forms, and software installation procedures (if applicable) are to be uncomplicated to help 'persuade' certain contractors, consultants, suppliers, etc. to participate in an e-Tendering process.
- Additional e-Tender implementation issues that require consideration include:
 - liability for lost or corrupted data;
 - ensuring that the servers are well protected – that is, having 'fallback' plans/procedures in place for when the e-Tender service were unavailable (off-line);
 - ensuring that firewalls do not restrict the dissemination of supporting tender related documentation (ITCBP 2003).

8.5 Legal

Legislatures are identified as typically 'lagging' behind technical innovation and social change (Woulds J. 1997). The successful implementation of an e-Tendering process within the industry, for example, is susceptible to the current legal status regarding electronic transmissions, use of electronic signatures, etc. Furthermore, commitment by both government and industry sectors is required to help develop more innovative strategies to build a stronger and more competitive construction industry. Ongoing legal investigations, aimed at strengthening organisational and individual use of electronic communications on projects must continue, by providing better management of communication risks such as:

- **Authenticity:** This concerns the source of the communication - does it come from the apparent author?
- **Integrity:** Whether or not the communication received is the same as that sent - has it been altered either in transmission or in storage?
- **Confidentiality:** Controlling the disclosure of and access to the information contained in the communication.
- **Matters of evidence:** This concerns e-communications meeting current evidentiary requirements in a court of law, for example, a handwritten signature.
- **Matters of jurisdiction:** The electronic environment has no physical boundaries, unlike the physical or geographical boundaries of an individual state or country. This means that it may be uncertain which State's or country's laws will govern legal disputes about information placed on the Internet, or about commercial transactions made over the Internet (Electronic Transactions Act 2001).

8.6 Summary

Construction organisations are faced with many new challenges, including the need to change current work practices; become more client orientated; competitive; and productive (Love P.E.D. 1996). These challenges are attributable to factors that effect the working environment, including globalisation of the economy; greater performance expectations from the clients; increased competition between local contractors; and continued restructuring of work practices

and industrial relations. The industry has to realise that investing in ICT is no longer primarily buying a piece of hardware or software. It is now more of a potential long term investment in the process of change itself (Cleveland Jr. A.B. 1999); (Buch K. and Wetzel D.K. 2001). Unfortunately, the nature of the industry's constructed products, its organisations and processes, limit technological change within the industry (Gann D. 1997).

Sharing project information electronically - from inception, design, through construction, and into building operation – can lead to large efficiency gains for all parties involved. Research suggests the eventual goal of the construction industry should be to better integrate the supply chain and all other business functions, allowing new, more efficient ways of working. The extent to which a construction company adopt these applications will depend on its specific circumstances and decisions made according to normal, sound business and strategic objectives (ITCBP 2003).

Finally, if Australian organisations continue to explore the competitive 'dynamics' of the construction industry, without realising the current and future, trends and benefits of adopting innovative processes, such as e-Tendering, it will limit their globalising opportunities to expand into overseas markets and allow the continuation of international firms successfully entering local markets.

9 CONCLUSION

In this uncertain and ever changing world, the construction industry and its participants need to be creative, alert to opportunities, responsive to external stimulus, have a good grasp of the changing environment, and increase existing levels of confidence in its ability to adapt (Banks E. 1999). It is been over 40 years since the introduction of ICT tools and systems into the construction industry, yet organisations are still unable to obtain the many potential benefits of ICT investment - many years after the initial expenditures have been incurred. Furthermore, the industry has been identified as 'slow' in embracing innovative ICT tools and systems such as eCommerce, e-Tendering, etc (Stewart R.A., Mohamed S. et al. 2002).

These e-Activities will underpin further growth in the Australian economy, enabling innovation and significant advances in productivity and efficiency within and across industry sectors. While the continued development of these e-Activities are widely recognised as major 'dynamics' in business, there are signs that a more realistic understanding is emerging of how they will act to transform business. The e-Commerce, e-Procurement and e-Business market has seen significant changes over the last two years, focusing on moving beyond the technology and towards how these tools can make business processes and relationships more efficient. The underlying principles of doing business are proving to be just as important in the information age. (APCC 2001).

The pace of change will be fast and all embracing. It will create more and greater business opportunities than ever before, both at home and overseas. It will be highly dependent on information sharing, customer-centric thinking, electronic processes and co-operation at every level throughout an integrated supply chain. It will also embrace a changed 'cultural thinking' that impacts on and benefits numerous aspects of the user environment (Foresight 2000).

The construction industry must take into account that the successful implementation of any electronic tendering system often directly depends on the successful integration of innovative ICT / internet solutions, with traditional and frequently archaic processes. Achieving this integration can be a complex process, and if not done correctly, could lead to failure (Bourn J. 2002).

10 BIBLIOGRAPHY

ABS (1999). Government Use of Information Technology (8119.0): 1997-98. Canberra, Australia, Australian Bureau of Statistics (ABS).

Anumba C.J. and Ruikar K. (2002). "Electronic Commerce in Construction: Trends and Prospects." Automation in Construction **11**.

APCC (2001). B2B E-Commerce: Capturing Value Online. Canberra, Australia, Commonwealth of Australia - Australian Procurement & Construction Ministerial Council (AP CC).

APCC (2002). Government Framework for National Cooperation on Electronic Procurement. Canberra, Australia, Australian Procurement and Construction Council (APCC).

ASITE (2003). The ASITE Solution. Tendering Solutions.
<http://www.asite.com/a3/uk/Solutions/Tendering/>.

B&C Watch (2001). Online Tenders Generate Govt Savings. B&C Watch: Slattery's Watch for the Building and Construction Industry. **9 October**.

Banks E. (1999). "Creating a Knowledge Culture." Work Study **48**(1).

Bid Express (2003). Bid Express On-line Bidding Exchange: About Bid Express.
<http://www.bidx.com/main/info/>, Bid Express. **2003**.

BiP (2003). About BiP. <http://www.bipcontracts.com/about.htm>, Business Information Publications Ltd (BiP). **2003**.

BiP (2003). e-Government Bulletin: Breakaway e-Tender Pilot Hangs on while Centre Fails.
http://www.bipcontracts.com/about/html/e_government_bulletin.htm, Business Information Publications Ltd (BiP). **2003**.

BiP (2003). e-Tendering Delta Suite. <http://www.bipcontracts.com/Delta/delta.html>, Business Information Publications Ltd (BiP). **2003**.

BiP (2003). Latest News. <http://www.bipcontracts.com/about/about3.htm>, Business Information Publications Ltd (BiP). **2003**.

Bourn J. (2002). Better Public Services Through e-Government. London, National Audit Office (NAO) www.nao.gov.uk: 29.

Bray R. (2002). The Tender Trap: Merx Contract Takes Heat from Suppliers and Competitors. Summit: Canada's Magazine on Public Sector Purchasing.
http://www.summitconnects.com/Summit_Magazine/magazine_contents/magazine_contents.htm, The Summit Group. **June**.

Buch K. and Wetzel D.K. (2001). "Analysing and Realigning Organizational Culture." Leadership & Organization Development Journal **22**(1).

Byatt I. (2001). Government Procurement Forum: Leading the Way, Delivering Better Services for Citizens. UK, Local Government Procurement Taskforce. **Edition No.14**.

Cabrera A., Cabrera E.F., et al. (2001). "The Key Role of Organisational Culture in a Multi-System View of Technology-Driven Change." International Journal of Information Management **21**(3).

Chang-Sup J. (2002). Effective Tendering in International Thermal Coal Markets. 4th APEC Coal Trade and Investment Liberalization and Facilitation (TILF) Workshop (<http://apec-egcfe.fossil.energy.gov/>), Kuala Lumpur, Malaysia, APEC Energy Working Group.

CITE (2003). Making e-Business Happen. CITE Information Pack. <http://www.cite.org.uk>, Construction Industry Trading Electronically (CITE). **2003**.

Cleveland Jr. A.B. (1999). "Knowledge Management: Why It's Not an Information Technology Issue?" Journal of Management in Engineering(November/December).

Commerce@work (2003). e-Workplace. e-Tender. <http://www.commerceatwork.com.au>. **2003**.

Commonwealth Government (2001). Electronic Transactions Act 1999. Canberra, Australia, Office of Legislative Drafting, Attorney-General's Office. **Act No 162**.

CRISP (2000). Report on a Workshop: Technological Change and Rethinking Construction. UK, Prepared by Lorch Associates for the Construction Research and Innovation Strategy Panel (CRISP) Commission.

DCITA (1998). Where to go? How To Get There? Canberra, Australia, Commonwealth Department of Communications, Information Technology and the Arts (DCITA).

DIST (1998). Stats. Electronic Commerce in Australia. Canberra, Australia, The Director Corporate Communication Section, Department of Industry, Science and Tourism (DIST).

e-Business Guide (2003). Doing Business with Government Online. http://www.e-businessguide.gov.au/site/text_only.cfm?nav_id=689, e-Business Guide. **2003**.

Ecommerce, D. (2002). Dr. Ecommerce: Answers Your e-Questions (<http://europa.eu.int/ISPO/ecommerce/drecommerce/index.html>). **2002**.

eConstruction (2003). e-Tenders@eConstruction. <http://www.econstruction.com.my>, eConstruction. **2003**.

E-Government Bulletin (2001). Procurement Office Unveils Online Tendering. <http://headstar.com/egb/archive2.html>, E-Government Bulletin. **2003**.

Electronic Transactions Act (2001). Electronic Transactions Act No: 162 of 1999. Canberra, Office of Legislative Drafting, Attorney General's Department.

ELTON (2003). Electronic Tendering Online (ELTON). <http://www.suffolkcc.gov.uk/procurement/elton.html>, Suffolk County Council. **2003**.

e-Tender (2003). e-Tender: The Global Solution. <http://ocean.ucc.ie/02/dsh1/ETender/index.php>, e-Tender. **2003**.

Foresight (2000). Constructing the Future: Making the Future Work For You. UK, Foresight, Built Environment and Transport Panel, Construction Associate Programme.

Gann D. (1997). Technology and Industrial Performance in Construction. Brighton, UK, Prepared by University of Sussex, for OECD Directorate for Science, Technology and Industry.

Gershon P. (2001). Paper Based Tendering System to give way to e-Tendering and £13 Million Savings.
http://www.ogc.gov.uk/application.asp?app=press_release.asp&process=full_record&id=11, Office of Government Commerce (OGC). **2003**.

Harty C. (2003). The Re-Organising of Construction Design Information Technologies and Coordination in Construction Practice. Construction Innovation and Global Competitiveness - 10th International Symposium, USA, CRC Press.

HDBuilders.com (2003). About us. <http://www.hdbuilders.com>, HDBuilders.com: Housing and Development Board (HDB).

IIB (2002). e-Business & m-Commerce (www.iib.qld.gov.au/guide), Information Industries Bureau (IIB), Queensland Department of Innovation and Information Economy. **2002**.

IIB (2002). e-Security (www.iib.qld.gov.au/guide), Information Industries Bureau (IIB), Queensland Department of Innovation and Information Economy. **2002**.

Industry Science Resources (1999). Building For Growth: An Analysis of The Australian Building and Construction Industries. Canberra, Ausinfo.

ITCBP (2003). e-Construction, e-Procurement and e-Tendering.
<http://www.itcbp.org.uk/econstruction/>, Information Technology Construction Best Practice (ITCBP). **2003**.

Kajewski S. and Weippert A. (2000). Online Remote Construction Management: Literature Review. Brisbane, Australia., Queensland University of Technology (QUT).

Love P.E.D. (1996). Enablers of Process Re-engineering. International Construction Information Technology Conference - Bridging The Gap(April 18-19), Sydney.

Love P.E.D., Tucker S.N., et al. (1996). "Construction Process Re-engineering and The Australian Construction Industry." Australian Institute of Building Papers **7**.

Mach30 (2003). About us. <http://www.mach30.com>, Mach30: Solutions to Link Businesses.

McCrea A. (2002). "Online Tendering: Online Bidding - Controversy or Welcome Practice?" The Architects' Journal **Report: 5752**.

Murray M., B. D. (2003). The Development of E-Commerce within the Global Construction Industry. Construction Innovation and Global Competitiveness - 10th International Symposium, USA, CRC Press.

Newman D. (2002). The Chatroom: It's about e-Tendering Government Contracts. Summit: Canada's Magazine on Public Sector Purchasing.
http://www.summitconnects.com/Summit_Magazine/magazine_contents/magazine_contents.htm, The Summit Group. **December**.

NOIE (2002). Doing Business Online with Government. A guide for Suppliers to Trade Electronically with Commonwealth Government Agencies. Canberra, Australia, National Office for the Information Economy (NOIE).

NOIE (2003). E-Government Strategies and Implementation. http://www.noie.gov.au/projects/egovernment/Better_Business/eproc_CETS.htm, National Office for the Information Economy (NOIE). **2003**.

NSW Department of Commerce (2003). Welcome to the eTendering System Help Page. https://tenders.nsw.gov.au/commerce/shared/help.cfm?p_page=rulesoftendering&p_pagetitle=Rules%20of%20Tendering, New South Wales (NSW) Department of Commerce. **2003**.

NSW Government (1998). Information Technology In Construction - Making IT Happen., Sydney, New South Wales (NSW) Government: Department of Public Works and Services (DPWS).

NSW Government (2000). Your Guide to Tendering - Construction Works. Sydney, New South Wales (NSW) Department of Public Works and Services (DPWS): pp5-7.

NSW Government (2001). Electronic Procurement Implementation Strategy (<http://www.cpssc.nsw.gov.au/e-procurement/contents.htm>). Sydney, New South Wales (NSW) Department of Public Works and Services (DPWS). **Report No 01063**.

NSW Government (2002). Code of Tendering for the Construction Industry - Exposure Draft (<http://www.cpssc.nsw.gov.au/codesreview/>). Sydney, New South Wales (NSW) Government. **April**: p6.

NSW Government (2002). Electronic Procurement Implementation Strategy - Guidelines (<http://www.cpssc.nsw.gov.au/e-procurement/contents.htm>). Sydney, New South Wales (NSW) Department of Public Works and Services (DPWS). **Report No 02010**.

NSW Government (2003). Electronic Procurement Implementation Strategy - Meeting the Challenge. <http://www.cpssc.nsw.gov.au/e-procurement/>, New South Wales (NSW) Government. **2003**.

NSW Government (2003). Welcome to the eTendering System Help Page. https://tenders.nsw.gov.au/commerce/shared/help.cfm?p_page=rulesoftendering&p_pagetitle=Rules%20of%20Tendering, New South Wales (NSW) Government Department of Commerce. **2003**.

NT Government (2000). An Introduction to "Tenders Online", Northern Territory (NT) Government: Department of Corporate and Information Services (DCIS) Contract and Procurement Services.

NT Government (2000). An Introduction to "Tenders Online", Northern Territory (NT) Government: Department of Corporate and Information Services (DCIS) Contract and Procurement Services.

NT Government (2001). eLodgement: Tender's User Manual, Northern Territory (NT) Government: Department of Corporate and Information Services (DCIS) Contract and Procurement Services.

Olesen K. and Myers M.D. (1999). "Trying to Improve Communication and Collaboration with Information Technology: An Action Research Project Which Failed." Information Technology and People **12**(4).

One NorthEast (2003). http://www.onenortheast.co.uk/home_nonflash.cfm, The Development Agency for North East of England. **2003**.

- Pietroforte R., C. N. (2003). E-Construction in the USA: A New Research Agenda. Construction Innovation and Global Competitiveness - 10th International Symposium, USA, CRC Press.
- Plasticsahead.com (2003). Reverse Auction. <http://www.plasticsahead.com/html/faq.htm>, Plasticsahead.com.
- Queensland Government (2001). Electronic Transactions (Queensland) Act 2001. Brisbane, Queensland Government. **Act No 42 of 2001**.
- Queensland Government (2001). A Strategy to Promote e-Commerce in Queensland: e-Commerce@smartstate.au - Working with the World. Brisbane, Queensland Government: Department of Communication and Information, Local Government, Planning and Sport (DCILGPS).
- Queensland Government (2002). Electronic Tender System: Departmental Briefing. eTender Information Session. Brisbane, Queensland Government: Department of Public Works and Project Services (DPWPS).
- Queensland Government (2002). eTender System. Brisbane, Queensland Government: Department of Public Works and Project Services (DPWPS).
- Queensland Government (2002). Prequalification (PQC) System. <http://www.build.qld.gov.au/industry/industry02.asp#pqc>, Queensland Government: Building Division. **2003**.
- Russell J.S. (2000). "Trends in Our Industry (Editors Letter)." Journal of Management in Engineering(January/February).
- SA Government (2003). Welcome to the SA Tenders & Contracts Website: News. <http://www.tenders.sa.gov.au/index.do>, South Australia (SA) Government. **2003**.
- Stewart R.A., Mohamed S., et al. (2002). "Strategic Implementation of IT/IS Projects in Construction: A Case Study (Article in Press for Publication)." Automation in Construction.
- Tenderlink (2002). Introduction. <http://www.tenderlink.com/explorer.htm>, Tenderlink. **2003**.
- Tenders Online (2003). About Tenders Online. <http://www.tendersonline.com.au>, Tenders Online. **2003**.
- TenderTrust (2003). The Only Choice for e-Tendering. <http://www.tendertrust.com/>, TenderTrust. **2003**.
- The Construction Confederation (2001). An Introduction to e-Business in Construction. <http://www.thecc.org.uk/index.asp?page=whatsnew> (Publications), The Construction Confederation. **2003**.
- Thiess (2003). Construction Industry Trading Exchange (CITE). http://www.thiess.com.au/index.cfm/client_cite, Thiess. **2003**.
- Thorpe T. and Mead S. (2001). "Project-Specific Web Sites: Friend or Foe?" Journal of Construction Engineering and Management(September/October).
- Victoria Government (2000). Making e-Commerce Work for You. Melbourne, Department of State and Regional Development.

Victoria Government (2003). eTenders: Victorian Government Tenders System. http://www.tenders.vic.gov.au/domino/web_notes/etenders/etdrpublishing.nsf?Open, Victoria Government. **2003**.

WA Government (2001). Gem Tendering. <http://www.gem.wa.gov.au/Gem/Tendering>, Western Australia (WA) Government: Contracting Information Bulletin Board. **2003**.

Worthington R. C. (2002). The Devil is in the Details: e-Tendering Poses Potential Legal Risk. Summit: Canada's Magazine on Public Sector Purchasing. http://www.summitconnects.com/Summit_Magazine/magazine_contents/magazine_contents.htm, The Summit Group. **Autumn**.

Woulds J. (1997). Information Privacy and Security - A Regulator's Priorities. Information Security Technical Report. **2**.

11 APPENDICES

Appendix I: 2001-008-C Project Schedule

Figure 11-1: 2001-008-C Project Schedule



Appendix II: eTender System Qualitative Questionnaire

QUALITATIVE QUESTIONNAIRE

Queensland Department of Public Works & Project Services (QDPW/PS) eTender System

*PLEASE NOTE: contact and prequalification details will **NOT** be disclosed and the information collected from this questionnaire will remain **CONFIDENTIAL** (at the individual response level) with only summarised findings and analysis used for public distribution.*

NAMES : Confidential

POSITIONS : Principal, Estimator, Two Directors, State Manager & Assistant Manager

ORGANISATIONS : Two Contractors and four Consultants

1. WEB PAGE

- (a) What is your overall impression of the eTender Web page – i.e.: format, functionality, ease of use, help function, support desk, etc?

The overall impression of the eTender Web page was mostly positive, with its users describing it as:

- Professional.
- Logical, clear and well explained.
- Basic, straightforward and easy to use.

One of the respondents stated, "*The need for a user-friendly system was identified and created*" by Project Services.

- (b) Recommendations for improving the eTender Web page.

There were only three minor recommendations put forward on how to improve the e-Tender systems Web page.

- The first being the existing password access / process could be simplified and more user friendly.
- The second recommendation was that seeing "*simplicity and ease of use is the key*" in an e-Tender process, system administrators are to limit changing the set-up / format of the Web page.
- Lastly, end-users recommend including the ability to review their attached tender documents on the web page before actually submitting them – limiting the chance of attaching incorrect documents, etc.

2. SUCCESSES

(a) What has gone well with the use of the eTender system?

Since its inception, almost two years ago, there have been a number of positive experiences recorded when using the eTender system, including:

- Increased knowledge using an eTender process.
- New users have already been successful in winning a number of projects for themselves.
- The ability to submit a tender electronically and at the last minute – timing and accuracy of the system allows tenderers to 'hold out' for subcontractors to submit last minute prices/quotes.
- The ability to receive all tender documents and Addendums electronically - then 'seamlessly' being able to forward (e.g. via email) relevant documents to printers, suppliers and subcontractors.
- Reducing the need, cost and time spent in having to print, bind, and courier tender documents.
- Tender documents and Addendums are also professionally and securely managed, and recorded within the system.

(b) Has use of the eTender system improved overall efficiency on your project? (Yes / no) In what way?

One respondent stated that in some ways the eTender system has slowed down the process of information transfer (eg extra time required to first have to access the eTender system in order to download documents - instead of directly emailed documents). Yet, the majority of respondents agree - using the eTender system improved efficiencies, not necessarily on their individual projects themselves, but definitely on the overall tendering process (see previous response).

(c) Has the use of the eTender system improved the overall tender process (compared to traditional / paper-based methods) – i.e.: re information / documentation transfer, etc? (Yes / no) In what way?

Users of the eTender system mostly agree that when compared to the traditional / paper-based method, tendering electronically has definitely improved the overall tender process, stating:

- The overall process is faster and more efficient.
- The risk of missing deadlines, etc. decreased.
- The secure transmittal process of the eTender system limits the potential loss of documents.
- Mail out costs of hard copies to other trades / subcontractors has reduced because they are now able to email the relevant documents to them.
- Where trades / subcontractors are not able to receive emailed documents (due to limited ICT and Internet infrastructures), contractors and consultants can still send them the documents electronically via CD's in lieu of hard copies. Yet, it was mentioned that a large portion of documents still need to be printed out due to many of the trades and subcontractors '*are yet to catch up with the technology*'.

- (d) What potential improvements (if any) do you perceive result from using an e-Tender process – e.g.: modification / upgrading of existing information and communication technology tools, systems, processes, hardware, software, etc?

Perceived improvements resulting from using an eTender process included:

- Trades / subcontractors are now 'forced' to upgrade their existing and/or invest in new hardware and software to take advantage of an electronic tendering process, which in turn may create 'a gap in the market' as not all Trades / subcontractors are willing to do this due to various reasons.
- Effective use of PDF files.

3. FAILURES

- (a) What issues / problems / complaints were experienced using the e-Tender system?

Issues, included:

- The need for tenderers to download eTender's '*standard information*' each time they want to tender - requesting Project Services not '*overload*' the system and to '*keep things simple and standardised*'.
- The need to improve the current eTender 'submit' process:
 - Some suggesting the eTender system should allow its users to review, change and/or delete their attachments prior to actually submitting the final tender.
 - Others suggest due to tenderers currently being able to complete (fill in) the e-tender form only towards the end of a tender (i.e.: only once they have received last minute rates, etc from their various subcontractors and suppliers), places additional '*pressure*' on those submitting the tender - potentially causing errors.
- The fact that many of the trades, subcontractors and suppliers are still unable to manage information and documentation / drawings electronically (i.e. receive, send, etc), seems to be an ongoing concern for certain eTender users – mainly due to substandard levels of ICT infrastructures in place.
- Several eTender system users found downloading of certain large files/documents took time and that '*it would have been just as easy to issue a CD*'.
- Drawings not to scale.
- eTender system users experiencing one or two initial problems when they first used the nominated eTender password, but these were quickly resolved.
- Others feel the current password system / process needs reviewing.

- (b) How have the above problems been addressed?

With the introduction of Broadband and by upgrading their existing phone systems to an Asymmetric Digital Subscriber Line (ADSL), dramatically decreased downloading time of tender documents.

Several eTender users contact and record each trade, subcontractor and supplier's preferred format (paper or electronic) and method of transmitting tender documents (e.g. via email, eTender system, CD, courier, etc.). Yet, when in doubt, tenderers will simply send out both electronic and paper copies.

4. LEGAL ISSUES

How have you/your organisation overcome potential legal issues associated with using electronic as opposed to traditional methods of tendering – e.g.:

- (a) **Authenticity / Evidence:** This concerns the source of the communication - does it come from the apparent author, for example, a handwritten signature?
- (b) **Integrity:** Whether or not the communication received is the same as that sent - has it been altered either in transmission or in storage?
- (c) **Confidentiality / Security:** Controlling the disclosure of / access to the information contained in the communication.

Several eTender users state they have no real concerns regarding legal issues when using electronic methods of tendering. Some describe themselves as being very much '*relaxed*' with it all and using it "*in good faith*". In most cases, tenderers tend to retain copies of all items sent electronically for record purposes. Where required, all documents are signed electronically (scanned hand written signatures).

Some tenderers were concerned with how certain '*extenuating circumstances*' are legally dealt with when submitting final tenders electronically – i.e. what happens when, for example, their own Internet Server fails, preventing their tender being submitted on time? According to the eTender technical team, this has not happened yet. This of course does not mean that it could not happen in future. However, due to regular backups of the eTender system and with backup servers in place, these risks are effectively reduced. Currently, tender managers, in conjunction with the eTender technical team, deal with all technical related issues that may cause delays, on a project-to-project base.

5. TRAINING

- (a) What type of eTender system training have you received from the QDPW/PS – i.e.: demos, hands-on, etc.?

The hands-on training and telephone assistance, offered by Project Services, were well received by the contractors and consultants who attended these sessions.

- (b) Was this sufficient for you to effectively use the eTender system? (Yes / no)

Those who received training all answered '*Yes*' to this question.

- (c) If not, what type of training would you have preferred to be proficient in the effective use of the e-Tender system?

N/A – based on previous responses.

- (d) Do you believe the eTender system is 'user-friendly' enough (easy, logical, intuitive, etc) for potential users to negate the need for training? (Yes / no)

Respondents all agree that there is no need for training (depending on the various '*mindsets*' of its users) and that overall, the eTender system is '*very basic*' and easy enough to use.

6. RECOMMENDATIONS

- (a) What projects, organisations, etc. (size / type / etc) are most suited to implementing an eTender process?

The consensus was that most small, medium and large projects / construction companies; and large to medium trades suit an eTender process. One of the respondents answered this question by saying "*we have the tools, we should be using them*"

- (b) What projects, organisations, etc. (size / type / etc) would you recommend are not suited to implementing an e-Tender process?

Even though the majority agreed that most projects are suited for an eTender process (refer response to previous question), some do believe that smaller projects (e.g. minor works refurbishing and alterations), aimed at smaller contractors and trades, with limited ICT infrastructures in place, are not.

- (c) What should industry participants and/or the QDPW/PS do or change to more effectively use an eTender process?

Suggestions include:

- To do "*nothing*", that the eTender system is "*an effective system as it stands*".
- Increased access to electronic tenders on the eTender system will increase industry market awareness, experience and business opportunities.
- Keeping industry bodies up-to-date and informed with regard to eTender activities and successes will help fuel private industry uptake.
- The eTender process to be 'flexible' - designed on a project-to-project and region-to-region basis.
- Due to Project Services currently being perceived as using the eTender system for the transfer of tender documents only, it is suggested setting up a web site for each tender project (e.g. via Project Services' eProject system), which would contain additional information about each individual project. Providing access to, for example, a '*technical data library*', 3D models of the project (with walk-through capabilities), etc., which in turn will enable potential tenderers to gain a better understanding as to what the designers are trying to achieve, prior to submitting their final tender.

- (d) Would you recommend the use of the e-Tender system on future construction projects?

Everyone recommends the use of the e-Tender system on future construction projects. One of the users responded by saying,

"We are very happy with the eTender System and look forward to it being standard practice".

- (e) Kindly provide any additional comments, recommendations, etc. regarding the implementation, use, etc of the QDPW/PS e-Tender system.

One response recorded for this question:

"The eTender system was a delight to use" and that "it is excellent to see the 'smart state' implementing these smart systems".

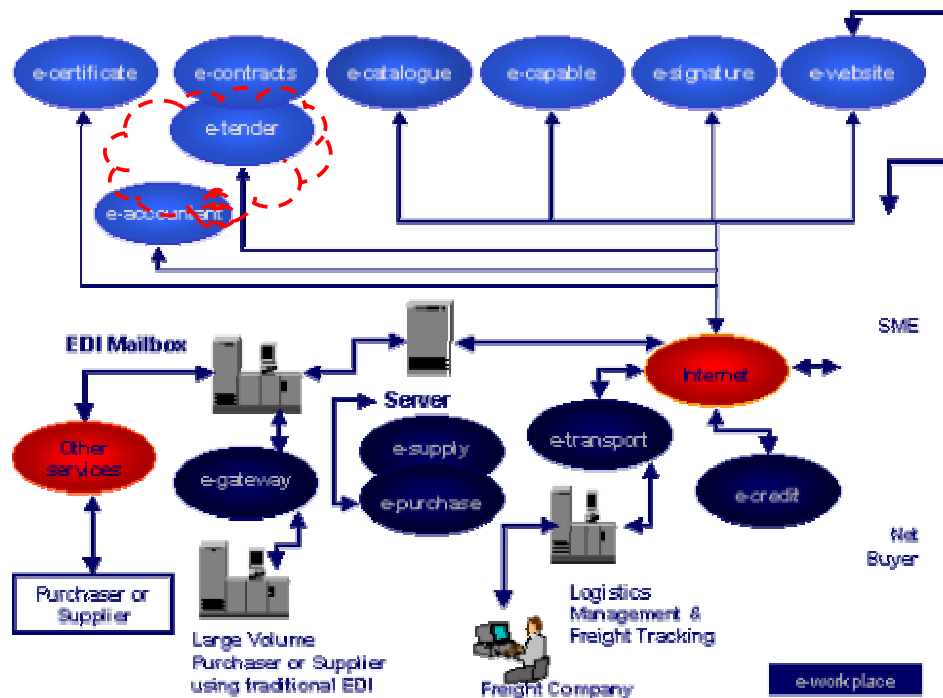
Appendix III: Additional eTender Systems

Additional web sites identified during this investigation as having particular 'electronic tendering' capabilities and functionality, are provided in the following sections. These vary from being reasonably advanced to more 'basic' electronic tender notification and archiving services for various industry sectors. Please note, access to some of these websites may at times not be possible, due to either the page being removed, had its name changed, or is temporarily unavailable whilst being updated. Nonetheless, the hyperlinks to the websites are still provided, based on their accessibility whilst compiling this report.

Australia

- (a) **Tenders Online:** A partnership between Maps Group Ltd (a national procurement organisation) and Online Australasia (successfully operating *Tenders Online* since 1995) to develop, promote and manage an internet-based tender registration and document distribution system for the benefit of suppliers and Maps Group members (<http://www.tendersonline.com.au>) (Tenders Online 2003).
- (b) **Commerce@work - e-Tender:** Commerce@work provides a complete range of electronic commerce services to benefit most areas of business, including electronic tendering and contract management (Figure 11-2). *e-Tender* allows purchasing organisations to list their tender documents, issue notices and responses to all responding organisations, and allows tenderers to place their response into this repository. All access is audited, all versions are maintained and tenders remain locked until date and time of closing. Special interest groups can be set up and tenders can be lodged for open or closed viewing (<http://www.commerceatwork.com.au/page7.html>) (Commerce@work).

Figure 11-2: Commerce@work Services



(<http://www.commerceatwork.com.au/page6.html>)

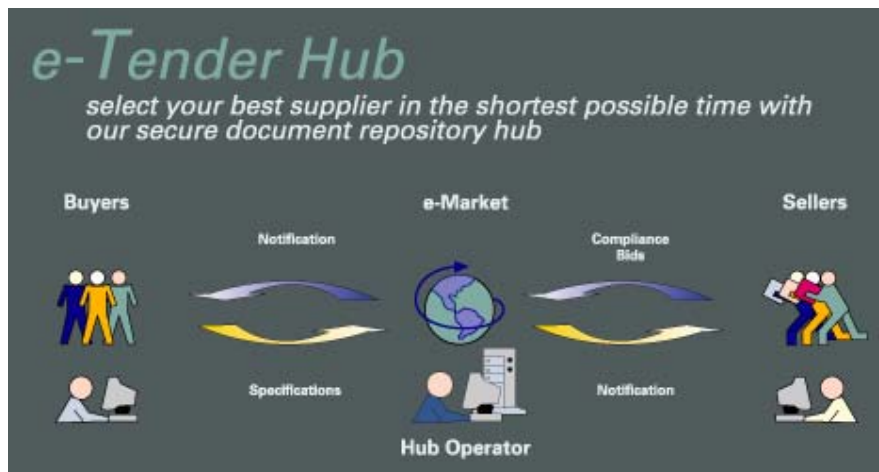
United Kingdom (UK)

- (a) **One NorthEast (n-e-Tenders):** The Regional Development Agency (RDA) - established in April 1999 - responsible for setting and implementing the agenda for economic and business development, regeneration and improvement in the North East of England (One NorthEast 2003). This is achieved through supplying, online, a range of regional and national, private and public sector procurement opportunities - designed to help companies regardless of their size or experience. *n-e-Tenders* (<http://www.n-e-opportunities.com/netenderhome.html>), for example, offers the opportunity to source relevant daily contracts and support online; direct access to hundreds of potential business opportunities; speedy notification of UK and worldwide tender opportunities; free online support to guide one through the tendering process; online translation facilities (for international trade); sub-contract opportunities; and archive of tender opportunities.
- (b) **Asite Tender:** Developed specifically for the UK construction industry, in collaboration with key industry players, to make it easier to prepare / manage a tender and participate as a bidder in a highly secure environment (<http://www.asite.com/a3/uk/Solutions/Tendering/>) (ASITE 2003).

Singapore

- (a) **HDBuilders.com:** Officially launched by Dr. John Chen, Minister of State for Communication and Information Technology and Minister of State for National Development on 12th September 2000. HDBuilders.com aspires to be Singapore's hub for e-commerce, e-project management, and information exchange (including eTender) for the local construction industry (<http://www.hdbuilders.com/NASApp/Nirman/Tender/jsp/TenderMainPage.jsp>) (HDBuilders.com 2003).
- (b) **Mach30:** An e-business solution for the construction industry by focusing on the facilitation of collaborative work (Mach30 2003). *Mach30* solutions cater to industry-specific key process such as the electronic calling of tenders, submission of tenders and consolidation of tender responses (Figure 11-3).

Figure 11-3: Mach30 eTender Process



(<http://www.mach30.com> – Products and Solutions)

Malaysia

- (a) **eTender@eConstruct:** Aims to capture the entire tendering process for the construction and other related industries (<http://www.econstruction.com.my>). described as being a 'secure and transparent' online process that is shaping them to a 'higher degree of efficiency, convenience, information-rich and information sharing' (eConstruction 2003).

Ireland

- (a) **e-Tender:** An expanding Irish organisation offering the world an electronic tendering and procurement system to firms seeking to purchase goods and services. *e-Tender* features include 'one stop' listing of current tenders/opportunities; electronic document/specification distribution; amendment notification system; and electronic tender boxes for easy submission (e-Tender 2003).

Appendix IV: eTender Technical Issues for Elaboration

As background information, the research team circulated the following issues of interest prior to discussions with eTender / QDPW staff.

The following discussion points were designed to elicit some background information on the **technical issues** surrounding the use of e-Tender-type approaches in the A/E/C industry.

It is not within the scope of these points to ascertain whether or not the current system addresses legislative requirements as may be embodied in an "Electronic Transactions Act" addressing paper vs. electronic transactions, and covering legal aspects such as:

- Matters of evidence: This concerns e-communications meeting current evidentiary requirements in a court of law, for example, a handwritten signature.
- Matters of jurisdiction: The electronic environment has no physical boundaries, unlike the physical or geographical boundaries of an individual state or country. This means that it may be uncertain which State's or country's laws will govern legal disputes about information placed on the Internet, or about commercial transactions made over the Internet

However, issues such as the Authenticity, Integrity, and Confidentiality of information and communications may be raised from a technical viewpoint.

The Supplier's (ie QDPW) Viewpoint

Security:

- security of documents in system / on server?
- of tender data submitted to system / server?
- back-up systems on critical dates e.g. submission deadlines.
- authenticity concerning the source of the communication - does it come from the apparent author?
- integrity - whether or not the communication received is the same as that sent - has it been altered either in transmission or in storage?
- confidentiality - controlling the disclosure of and access to the information contained in the communication.

Network Issues:

- requirements for adequate network bandwidth
 - any likely/actual bottlenecks in accessing data during peak loads?
- critical need for reliability of system
 - robust – any network problems at tender submission time?
 - audit trails - tracking source of any problem (theirs or ours?)

Document Management:

- tender list
 - automatically generated, or manual?
 - control of logon and permissions
- pre-qualification list
 - automatically generated, or manual?

- logon control and permissions
- project document management
 - placement of documents on system; appropriate formats?
 - placement of authorised revisions to documents?
 - checking access to documents and any revisions

All these three items may have an overarching imperative in the *ease of use* in placing *source* documents on the system.

People Issues:

- develop trust in security
- develop confidence in use
- minimise user interface issues
 - aid recovery from hitting wrong button
 - strong emphases on ease of use
- provide access to appropriate help – online, 24 x 7 assistance?
- training & certification

The Contractor's (or user) Viewpoint

Security Issues:

- acknowledgement of receipt of communications
- authenticity concerning the source of the communication - does it come from the apparent author?
- integrity - whether or not the communication received is the same as that sent - has it been altered either in transmission or in storage?
- confidentiality - controlling the disclosure of and access to the information contained in the communication.

Access Issues:

Access to Documents (setting aside issues such as quality of documentation):

- Ease of access for users
 - clarity of user interface
 - networking constraints
 - connection profiles in industry – current v. future (% dial-up v. ADSL v. cable broadband v. ISDN)

Access to Updates:

- Ease of access
 - clarity of user interface
 - explicit differentiation of update from original version
- Notification of document(s) issued
 - use e-mail, or another method? (fax, SMS, etc.)
 - acknowledgement of user's receipt of updates before lodgement of tender

Submission of Bid:

- Notification
 - use e-mail, or another method (fax, SMS, etc.)
 - acknowledgement of receipt of updates before lodgement of tender
- Security of information

-
- intermediate storage - when can selection panel see tender bids?
 - transmission (open, or encrypted?)
 - storage/archive (retained for what period after close of submissions?)
 - Long-term
 - compatibility between systems, and in-house electronic systems
 - bottlenecks just prior submission time / aggregation of work packages (e.g. to allow head contractor to submit by 5:00 pm, all sub-contractors packages must be received by say 4:45 pm, then packages put together and total bid submitted)
 - Backup systems
 - take account of unforeseen localised problems such as power outages; denial of access to server; etc.

People Issues:

- develop trust in security
- develop confidence in use
- user interface issues must be paramount
 - aid recovery from hitting wrong button
 - strong emphases on ease of use
- provide access to appropriate help – online; 24 x 7 assistance?
- training & certification

12 AUTHOR BIOGRAPHIES

Dr Stephen Kajewski

School of Construction management and Property
Queensland University of Technology
Ph +61 7 3864 2678, fax +61 7 3864 1170, email s.kajewski@qut.edu.au

Dr Kajewski is a senior lecturer with the School of Construction Management and Property at the Queensland University of Technology and is presently the A/Head of School of Construction Management and Property and the Course Coordinator for the Master of Project Management degree. Dr Kajewski is presently the Project Manager for a number of major research projects concerning the adoption and use of information and communication technology (ICT) being conducted in conjunction with the University, Government, and industry. The combined funded and in-kind value of these projects is exceeds A\$1.2M and while all different, they are based around the aim of developing and demonstrating leadership in facilitating the use of online technologies for the design, management and construction of building and civil construction projects by identifying and implementing ICT solutions that will improve resource management; support and integrate total project life cycle considerations; increase efficiencies on projects, ultimately reducing overall cost; and improving project outcomes to project participants in the public and private sectors.

Mr Achim Weippert

School of Construction management and Property
Queensland University of Technology
Ph +61 7 3864 2678, fax +61 7 3864 1170, email a.weippert@qut.edu.au

Mr Weippert is presently undertaking a PhD to identify key cultural 'drivers' or 'enablers' of ICT uptake within 'virtual' building and civil project team environments. He is also a Research Associate to Dr Stephen Kajewski (Project Leader) for the Cooperative Research Centre (CRC) for Construction Innovation research project 2001-008-C: 'Project Team Integration - Communication, Coordination and Decision Support'. Prior to this appointment, he was Research Assistant to Dr Stephen Kajewski (Project Manager) on the Online Remote Construction Management (ORCM) research project. The ORCM project was a major research project undertaken by the Queensland University of Technology (QUT) and Commonwealth Scientific Industrial Research Organisation (CSIRO) Construction Research Alliance (CRA), based at QUT, Brisbane, Queensland, Australia.

Mr John Crawford

CSIRO
Division of Manufacturing and Infrastructure Technology
Ph +61 3 9252 6051, fax +61 3 9252 6249, email john.crawford@csiro.au

Mr Crawford is a senior Scientist and Project Leader within the Integrated Design and Construction team at the CSIRO Division of Manufacturing and Infrastructure Technology, based at Highett, Victoria. He has been heavily involved in design research and in working with public and private industry in the innovative usage of ICT in building, construction, and engineering for many years - most recently as a team member of the Cooperative Research Centre (CRC) for Construction Innovation research project 2001-007-C: 'Managing Information Flows with Models and Virtual Environments'. He co-authored the key Technology Review for On-Line Remote Construction Management

(ORCM) report for the project - jointly supported by QUT, CSIRO and Queensland industry sponsors. In addition, Mr Crawford has been contributing to the novel CSIRO Emerging Science initiative in Tele-collaboration, and to an industry initiative in Geometric Data Exchange in the Australian Defence and Aerospace industries, as well as working on / leading projects for the architectural and engineering design professions regarding opportunities for High-bandwidth Design Interaction; and on Parametric Modelling at the Early Design stage. The common theme of his research interests (published in over thirty reports, book chapters, and papers) has been the concepts of virtual design and of integrated building information modelling and their potential for encouraging efficiencies and new paradigms in the design, construction and engineering industries.