

CRITICAL FACTORS THAT INFLUENCE E-PROCUREMENT IMPLEMENTATION SUCCESS IN THE PUBLIC SECTOR

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ABSTRACT. This paper presents the results of a literature survey developed to support a proposed model of the Critical Success Factors (CSFs) likely to impact the success of e-Procurement initiatives in the public sector. It identifies a number of relevant variables for each CSF and presents a model for future research. It also analyses the relative importance of different CSFs and observes that organization and management factors are the most important category for success of e-Procurement initiatives. If e-Procurement initiatives in the public sector are to assist the development of e-Procurement across the information economy, there should be wider discussion and agreement on what constitutes the relevant CSFs and how the achievement of success can be assessed.

INTRODUCTION

A number of public sector agencies worldwide have identified Electronic Procurement (e-Procurement) as a priority e-Government agenda and have implemented or are in the process of implementing buy-side e-Procurement systems. However, the scholarly evaluation of e-

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Procurement initiatives, especially in relation to the use of Critical Success Factors (CSFs) in e-Procurement is very limited (Birks, Bond & Radford, 2001; DOF, 2001; CGEC, 2002; ECOM, 2002). A review of e-Procurement literature, primarily from the last five years, shows a lack of core constructs around CSFs. The reason for this might be that implementation of e-Procurement initiatives in the public sector is still in the early stages. Tonkin (2003) argues there was little history of extensive use of e-Procurement in the public sector and, therefore, the academic literature covering early public sector adoption of e-Procurement is limited. This paper will assess the CSFs that are likely to influence the success of e-Procurement initiatives in the public sector. The main overall objectives of the paper are to gain an exploratory understanding of e-Procurement issues in the public sector; to develop a conceptual framework that aids in identification of critical success factors for adopting and implementing e-Procurement in the public sector; and to stimulate debate about the e-Procurement CSFs and the associated measures for success.

Through a survey of the e-Procurement literature, this paper identifies eleven factors: end-user uptake and training, supplier adoption, compliance with best practices for business case/project management, systems integration, security and authentication, re-engineering the process, top management support, performance measurement, change management, e-Procurement implementation strategy, and technological standards. In the following sections, this paper discusses the background, requirements, and the barriers to e-Procurement implementation in the public sector. Following the methodological approach, each CSF is discussed in detail and a research model is presented. Finally, an analysis of the relative importance of the CSFs is presented and the paper concluded with a discussion on the differences and similarities of e-Procurement projects compared with traditional IT projects in the public sector.

BACKGROUND

What is e-Procurement? Confusion exists in defining the term e-Procurement (Vaidya, Yu, Soar & Turner, 2003). While the terms “e-Procurement” and “e-Purchasing” have been used synonymously in many jurisdictions in an attempt to prove their involvement in the e-Commerce revolution (MacManus, 2002), the term “purchasing” has a

narrower scope. e-Procurement refers to the use of Internet-based (integrated) information and communication technologies (ICTs) to carry out individual or all stages of the procurement process including search, sourcing, negotiation, ordering, receipt, and post-purchase review (Croom & Brandon-Jones, 2004). While there are various forms of e-Procurement that concentrate on one or many stages of the procurement process such as e-Tendering, e-Marketplace, e-Auction/Reverse Auction, and e-Catalogue/Purchasing, e-Procurement can be viewed more broadly as an end-to-end solution that integrates and streamlines many procurement processes throughout the organization. Although the term “end-to-end e-Procurement” is popular, industry and academic analysts indicate that this ideal model is rarely achieved (DOIR, 2001) and e-Procurement implementations generally involve a mixture of different models (S&A, 2003).

Although such end-to-end solutions offer robust and usually rich functionality, they are designed specifically to excel in just one or a few applications and thus pose various challenges (Cuthbert, Hamzic & Archer, 2003). Nevertheless, this paper will refer to the end-to-end e-Procurement system in order to avoid confusion but will not consider general email, electronic fax, voice communications, or non-Internet/Web based approaches, which are regarded as partial traditional e-Procurement solutions. As one of the core enablers of an e-Business supply chain, e-Procurement in this article is conceptualized as a subset of e-Commerce. While e-Commerce is simply a transaction conducted electronically, e-Procurement is the automation of many procurement processes via electronic systems, especially the Internet. Having defined e-Procurement for the purpose of this paper, it is also important to also define the term “implementation”.

What is implementation? As with e-Procurement, implementation has been defined in different ways. A typical general definition from the Information Systems (IS) literature, states that implementation is “an effort beginning with the first thought of developing a system and not ending until the project is completed or abandoned” (Ginzberg, 1979, p. 408). Chan and Swatman (1998), however, state that IS implementation is best described as a process of organizational change that extends over a considerable period of time. More recent definitions of the term stem from the diffusion-based models of innovation adoption in relation to e-Commerce/e-Business (Srinivasan, Lilien & Rangaswamy, 2002). Cooper and Zmud (1990) propose a five-stage framework of initiation,

adoption, acceptance, routinization, and infusion explaining how an IT solution (application) is implemented in organizations, which, with the exception of infusion, forms the framework of this analysis. Infusion is the stage at which the e-Procurement solution is used within the organization to its full potential. As most e-Procurement initiatives are in their infancy, this sort of approach will guide the selection of some e-Procurement initiatives in the public sector and identify the most relevant CSFs for the purpose of this study.

Over the last 40 years, while private and public sector organizations have been utilizing Information Technology (IT) systems to streamline and automate their purchasing and other processes, it is only in the past decade that e-Procurement systems have attracted attention. While there is debate about how recently e-Procurement has emerged. (Dai & Kauffman, 2001; Koorn, Smith & Mueller, 2001), there is no doubt that the use of the Internet in e-Procurement provides several advantages over earlier inter-organizational tools. For example, Electronic Data Interchange has been providing automated purchasing transactions between buyers and their suppliers since it was launched in the 1960s. Enterprise Resource Planning (ERP) followed in the 1970s, and then came the commercial use of the Internet in 1980s. It was only in the 1990s that the World Wide Web - the multimedia capability of the Internet - became widely enabled and provided the essential resource for the automation of procurement (OGC, 2002).

According to Koorn, Smith and Mueller (2001), there are three types of e-Procurement Systems: Buyer e-Procurement Systems, Seller e-Procurement Systems and Online Intermediaries. This paper is focused predominantly on Buyer e-Procurement Systems, which typically demonstrate one of two systems philosophies in regard to e-Procurement: Enterprise Portal and Enterprise Application. While various e-Marketplaces have been launched based on the Enterprise Portal philosophy, the implementation of e-Procurement systems usually consists of two technologies within the Enterprise Application philosophy: a workflow system integrated with an e-Procurement application that supports requisition to payment; and the electronic catalogue that lists suppliers' items and prices over the Internet. Within these two philosophies, there are again two different approaches that the public sector agencies have used for implementation of e-Procurement: an end-to-end e-Procurement solution (the "big bang" approach), and the incremental implementation.

Some of the commonly used tools in the public sector are e-Tendering, e-RFQ, e-Auctions, e-Catalogues, and e-Invoicing. These tools, including complete marketplace technologies, have been developed by the key players in the e-Procurement market such as Ariba, CommerceOne, Oracle, and SAP. Regardless of the various shapes and sizes of e-Procurement systems in the market, it has been argued that the basic procurement process is the same across the public sectors and can be addressed with straightforward technology to automate standard processes (NePP, 2005). However, this paper has more of a conceptual approach to implementation of an innovation and, therefore, does not focus on the precise technical description of these e-Procurement tools. The fundamental problem motivating this study is the need to understand the CSFs underlying the implementation of e-Procurement initiatives in the public sector.

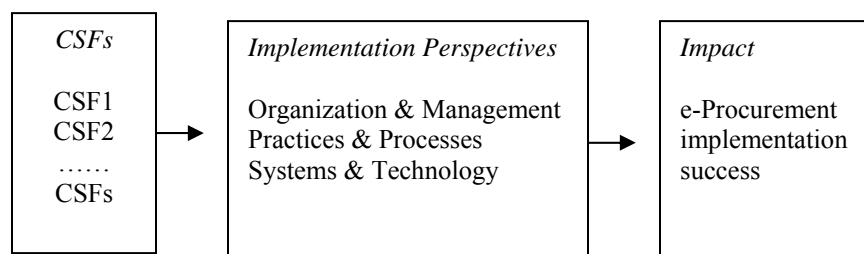
A CONCEPTUAL FRAMEWORK

The popularity of the Internet has significantly influenced organizations' intentions to use new inter-organizational systems (IOS) technologies such as e-Procurement. While researchers from Information Systems (IS) and management disciplines have studied the implementation issues of the traditional IOS in the private sector from various perspectives, there have been few implementation studies on Internet/Web-based IOS, especially on e-Procurement in the public sector. Furthermore, while there have been some academic studies conducted on the value of B2B e-Procurement (Subramaniam & Shaw, 2002), the e-Commerce procurement process (Yen & Ng, 2003), the classification of e-Procurement transactional structures (Croom & Brandon-Jones, 2004), and the impact of e-Procurement on buyer-seller relationships (Carr & Smeltzer, 2002), there appear to be relatively few detailed empirical studies on e-Procurement implementation (Croom & Brandon-Jones, 2004).

Building on the traditional IOS implementations, e-Procurement research has included a variety of constructs and measures in understanding and predicting implementation success (OSD, 2001; CGEC, 2002). A CGEC study (2002) has confirmed that a significant portion of the initial value proposition is often not ultimately delivered due to problems related to technology, business process, and/or people/organizational issues. Similarly, the Local Authority Strategy for

e-Procurement report (IBM, 2003) has identified the three areas where e-Procurement implementation strategy should be focused to ensure that the required practices, processes, and systems are developed and rolled out in a consistent manner across the public sector. As such, the three areas - organization and management, practices and processes, and systems and technology - have been termed as “implementation perspectives” for the purpose of this study. Each of these perspectives highlights important aspects of the e-Procurement implementation process. The overall conceptual model for this study presented below (Figure 1), emphasizes the interplay between the three perspectives and will serve as the basis for the development of the propositions about the impact of CSFs in implementation perspectives and on the success of an e-Procurement initiative.

FIGURE 1
Conceptual framework



Source: Original figure.

PUBLIC SECTOR PROCUREMENT REQUIREMENTS

Public procurement is an important function of government (Thai, 2001). It has to satisfy requirements for goods, works, systems, and services in a timely manner. Furthermore, it has to meet the basic principles of good governance: transparency, accountability, and integrity (Wittig, 2003; Callender & Schapper, 2003). Another main principle of governments is to achieve value for money in procurement (DOF, 2001). However, public procurement has been a neglected area of academic education and research, although governmental entities, policy-makers, and public procurement professionals have paid a great deal of attention to procurement improvements and reforms (Thai, 2001).

Conventional wisdom suggests that government procurement differs from private procurement. Public sector procurement is large and complex, accounting for between twenty and thirty percent of gross domestic product (Thai & Grimm, 2000) and traditionally attempts to meet many social and political objectives (Tether, 1977). Governments procure goods and, in order to preserve accountability and transparency services, use a complex contractual system designed to protect the public interest (Rasheed, 2004). While private sector procurement is practiced under the sponsorship of each individual firm's governance policies, public sector procurement must operate within a range of regulations and policies established to accomplish desirable social (Tether, 1977) as well as economic (OCIO, 2000), financial, and public audit requirements. Government procurement officials issue requests for bids and/or proposals with product or service specifications that are unique to each contracting event and economies of scale are difficult to achieve (Rasheed, 2004). There are also bargaining and opportunism costs of governance unique to public procurement that result in high transaction costs (Globerman & Vining, 1996).

A core difference is the relationship between the buyer and the supplier in each entity. In the public sector, the buyer attempts to include as many sellers as possible in order to broaden competition and maximize opportunities for value for money whereas, in the private sector, buyers may seek to use a small number of suppliers based on trusted relationships in order to minimize operating risks (OCIO, 2000). Governments are also obliged to disclose purchasing and contracting information to the public, including details about the outcome of government contracting decisions. While government procurement policies and legislation have been established to limit discrimination in government procurement, it is unclear how successful they have been (Rasheed, 2004).

Thai (2001) views the public procurement system from three perspectives: the nested structure of systems within systems, organizational structures within organizational structures, and many independent procurement systems. MacManus (2002) notes the need to re-examine the four key principles of lowest price; demonstrable separation of buyer and seller; fixed term, fixed price contracts; and accountability and transparency that have guided public procurement over the past few decades. These diverging views and established

principles may need to be examined as public procurement becomes more sophisticated and e-enabled.

RESEARCH QUESTION

Critical Success Factors (CSFs) have been selected for detailed research because they represent the areas or functions where events and actions must occur to ensure successful competitive performance for an organization (Butler & Fitzgerald, 1999). The concept of CSFs became popular in the field of management information systems in the 1970s when researchers at MIT investigated the importance of identifying CSFs to the design of information systems, and named their approach the CSF Method (Cheng & Ngai, 1994). Because e-Procurement is currently one of the key topics in the e-Government arena, many organizations need advice and guidance about proceeding with this new technology. Without a set of CSFs, it seems impossible to present the state of progress and assess the success of e-Procurement initiatives in the public sector. In this regard, the research question guiding this study is as follows:

What are the critical success factors that best support the implementation of e-Procurement initiatives in the public sector?

The unit of analysis for this study is the individual public sector agency that is involved in implementing e-Procurement initiatives.

METHODOLOGY AND A SURVEY OF E-PROCUREMENT CSFs

A literature survey is defined as “the documentation of a comprehensive review of the published and unpublished work from secondary sources of data in the areas of specific interest to the research” (Sekharan, 1992, p. 37). This section of the paper examined the literature for a number of e-Procurement initiatives in order to investigate whether a general set of CSFs for e-Procurement existed. This literature has been used for preliminary investigation into the CSF approach and for finding barriers and implementation outcomes of e-Procurement initiatives for the purpose of this study. While academic articles stimulate and provide theoretical understanding, the focus of this study has been to use the practitioner materials (mainly government reports) in order to capture the practitioners’ perceptions of e-Procurement practices. What was needed were multiple sources of data that could provide multiple insights into e-Procurement CSFs.

An extensive survey of the available e-Procurement literature uncovered assessment and evaluation reports of eight e-Procurement initiatives and five specialized research studies on e-Procurement that provided some answers to the research question. These thirteen reports were located through a Google search of the keywords “success” or “critical/key issues/factors”, and “e-Procurement” or its equivalent such as “online procurement” or “Internet/Web-based Procurement”. From this non-traditional literature survey, eleven factors emerged as critical to the successful initiative of e-Procurement implementations. These eleven factors were obtained after analysis and grouping of related sub-factors. And are inclusive of all the sub-factors identified in the survey. Table 1 presents the process of surveying CSFs for e-Procurement.

The literature survey method is composed of the following five phases:

1. This research design phase defined the research subject and scope and was largely completed by a literature review of relevant academic journal articles and trade literature.
2. This data collection phase located thirteen research documents pertaining to e Procurement initiatives in the public sector that became the primary research source for the study.
3. In this data analysis phase, data were divided, conceptualized and organized in order to triangulate information and clarify inconsistencies with additional papers published in journals, conference proceedings, and e-Procurement vendor-oriented popular business press.
4. In this phase, the CSFs identified were rated and ordered. The third phase was repeated for CSFs that had equal ratings. Such CSFs were further ranked and ordered according to the relative depth and breadth of coverage in the literature.
5. The CSFs were shown to be related to three categories of implementation perspectives as shown in the conceptual model (Figure 1). Performance measures for each implementation factor likely to impact the corresponding CSF were identified.

Including the specialized literature on e-Procurement (DOF, 2001; CGEC, 2002; ECOM, 2002; WB, 2003), the publicly available assessment/evaluation reports of the following major e-Procurement

initiatives in the UK, USA, Australia and European Union (2000-2003) were reviewed:

- Electronic public procurement pilot projects in the European Union (EPPPP) (PLS-Ramboll, 2000)
- General Services Commission (GSC), USA (DOIR, 2001)
- University of California (UOC), USA (KPMG, 2001)
- Enhanced Comm-Pass Initiative (ECI), Commonwealth of Massachusetts, USA (OSD, 2001)
- The ePilot Project (EPP), UK (OGC, 2002)
- Department of Premier and Cabinet (DOPC), Australia (S&A, 2003)
- Electronic Commerce for Procurement (EC4P), Australia (AGV, 2003)
- Government Electronic Marketplace (GEM), Australia (AOT, 2003)

In Table 1, the results of a survey of e-Procurement CSFs are presented. The CSFs are rated according to the number of citations present in the specialized literature and the assessment/evaluation reports of the initiatives mentioned above.

BARRIERS TO A SUCCESSFUL E-PROCUREMENT IMPLEMENTATION

While various governments are encouraging public sector agencies to adopt e-Procurement, its implementation does not appear to have been smooth and the rate of e-Procurement implementation success has been less than spectacular, as supported by Steinberg's (2003, p. 1) claim that "Government e-Procurement projects have been notoriously unsuccessful". The development and implementation of e-Procurement has not been as easy as some of the solution providers have suggested, nor has it necessarily brought the anticipated savings. Furthermore, engaging suppliers in the process - especially smaller organizations - is also proving to be difficult given the level of investment expected in terms of providing catalogue information to buyers, and marketplaces using different technologies, platforms and business languages (OGC, 2002).

TABLE 1
Survey of e-Procurement CSF

CSFs (number of citations)	S&A (2003)	AGV (2003)	WB (2003)	PLS-Ramboll (2000)	ECOM (2002)	KPMG (2001)	OGC (2002)	DOF (2001)	CGEC (2002)	OSD (2001)	Buy-IT (2002)	AOT (2003)	DOIR (2001)
End-user uptake and training (11)	x	x	x	x	x		x	x	x	x	x	x	
Supplier adoption (10)	x	x	x		x		x	x		x	x	x	x
System integration (9)	x		x	x		x	x		x	x		x	x
Business case/PM (9)		x		x		x	x	x	x	x		x	x
Re-engineering the process (8)	x	x	x			x	x		x	x	x		
Security and authentication (8)	x	x	x	x			x	x		x		x	
Top management support (7)	x	x	x				x		x		x	x	
Change management (7)	x	x	x				x	x	x				x
Performance measurement (7)				x			x	x	x	x		x	x
e-Procurement implementation strategy (7)	x	x		x	x			x					x
Technical standards (7)	x		x	x		x	x	x				x	

Source: Original table.

Difficulties also seem to stem from the tension between Buy Local policies designed to promote a local economy, and the efficiencies to be achieved through volume purchasing from large suppliers (AGV, 2003). Although a number of public sector agencies are actively pursuing e-Procurement, evidence from business press reveals that many of the efforts are not meeting original expectations. In fact, implementation rate of public procurement systems has been slow and many government agencies tend to overstate the degree to which they are involved in e-Procurement (MacManus, 2002). Despite the benefits that can be

achieved from a successful e-Procurement implementation in the public sector, the business press has reported a number of failures of e-Procurement initiatives in a number of public sector agencies in the USA, UK and New Zealand in recent years. As observed by Heywood (2002), e-Procurement will result in large investments of time and money, without absolute certainty that its full potential will be achieved every time.

These views are supported by a number of cases reported in the business press. The US Government's General Services Administration had been criticized following embarrassing revelations that it was unreliable and error-prone (KableNet, 2002), while the British government decided not to extend its pilot e-tendering system across Whitehall (KableNet, 2002). In a similar vein, Bell (2003), Doesburg (2003), and Gifford (2003) report that the New Zealand Government's GoProcure e-Procurement system has proved more complex to develop than expected, while the UK Ministry of Defence is yet to achieve savings three years after its e-Procurement service first started running (KableNet, 2003). According to Garson (2004), the State of South Carolina abandoned its e-Procurement system in June 2002 and pilot projects were shut down in 2002 in Massachusetts, Indiana, and Michigan. The Virginia state auditor reported only 1.5 percent of the state's business was transacted through its state-of-the-art \$USD14.9 million system (Garson, 2004).

There is, however, a view that the rumors of e-Procurement's demise have been greatly exaggerated (Harris, 2002). For example, Davila, Gupta and Palmer (2003), using a survey of 168 US public and private sector organizations, indicate that e-Procurement technologies will become an important part of supply chain management and that the rate of adoption will accelerate as the adopters share their experiences of success factors and perceptions of low risk. Similarly, Barua, Konana, Whinston and Yin (2001) identified e-Procurement as the element of e-business most contributory towards the e-Business operational excellence of large corporations.

Such success and failure stories imply that there is a need for a much better understanding of CSFs in regards to the e-Procurement implementations and use in the public sector. Tonkin (2003, p. 13) provides a succinct summary of this sector's relationship with e-Procurement: "The public sector cannot afford to uncritically follow the

latest fads and fashions, it can, however, form a strong base of self knowledge, confidence and with an eye to the future become an innovator in this field”.

E-PROCUREMENT CSFs AND PROPOSITIONS

Since the observations reported in this paper are limited to evaluation/assessment reports of eight major e-Procurement initiatives and five specialized literature on e-Procurement, it is necessary to be very cautious in the presentation of results. Hence, the findings of this study will be presented in the form of propositions, rather than hypotheses, to be refined by interviews and confirmed by case studies. The resulting hypotheses will then need to be tested by means of a survey research.

End-User Uptake and Training

As e-Procurement includes new technologies and changes in traditional procurement approaches, the need to train staff in procurement practices and the use of e-Procurement tools are critical to the success of an e-Procurement initiative (WB, 2003). End-users can realize the immediate benefits of the e-Procurement system once they understand the operational functionalities (CGEC, 2002). This means that training should be given a high priority, alongside the need for public sector agencies to identify the skills required by all those engaged in procurement (ECOM, 2002).

As technology alone does not ensure successful adoption, the success of a public sector e-Procurement initiative depends on users and buyers making use of the new process and system. The solution must attract end users to view e-Procurement as the preferred means by which to purchase goods and services (KPMG, 2001). The success of the project also depends on communication to the users (Birks, Bond, & Radford, 2001). According to the CGEC (2002), the two major obstacles to increasing support among users are their level of technological awareness and acceptance, and their willingness to change long-established internal business processes. As the implementation process develops, periodic user satisfaction surveys may identify the possible need for additional training (OSD, 2001).

Proposition 1: *The high level of end-user uptake and training is positively associated with the organization and management implementation perspective of an e-Procurement initiative.*

Supplier Adoption

E-Procurement implementation success is closely related to early supplier involvement. It is important to demonstrate the proposed solution to the suppliers and discuss any necessary changes, issues, and concerns such as various options in developing and maintaining supplier catalogues (Birks *et al.*, 2001). According to the OSD (2001), providing opportunities for suppliers to offer their feedback will allow the public procurement department to monitor areas for improvement and adjust practices accordingly. Because many suppliers may be unwilling to conduct business electronically with public sector agencies because they are unclear about the benefits to be gained, they might see e-Procurement as a means by which public sector agencies will simply attempt to force down prices (ECOM, 2002). Suppliers, therefore, should be educated on the e-Procurement benefits that can be provided to them through a process of consultation as early as possible in the project. The degree to which the success of an e-Procurement initiative can be realized may well be related to the level of e-readiness of suppliers, and appropriate communication with suppliers is therefore important (AOT, 2003).

Proposition 2: *The high level of supplier adoption is positively associated with the organization and management implementation perspectives of an e-Procurement initiative.*

Compliance with Best Practice for Business Case/Project Management

e-Procurement initiatives only deliver the planned benefits if the users and buyers make changes to the way they work, which requires championing the project and senior management sponsorship. Specifically important, but also challenging, is ensuring “Buy In” (Birks *et al.*, 2001). Birks *et al.* (2001) suggest that the business case processes for e-Procurement should include identifying drivers, understanding the starting point, benefits, approaches, affordability, risks, and benefit realization. To ensure achievement of the e-Procurement objectives, the implementation project should proceed, as far as possible, in alignment with the business case.

Proposition 3: *The high level of compliance with best practice/project management is positively associated with the organization and management implementation perspective of an e-Procurement initiative.*

System Integration

It is very important to determine the level of integration required between the e-Procurement solution and existing information systems (KPMG, 2001). The CIPFA report reasoned that if integration issues are complex, it is more likely that underlying business processes within an organization should be changed or adapted (ECOM, 2002). It is also critical to link the e-Procurement system to the financial management system in order to facilitate the process of online payment to suppliers (WB, 2003). It is necessary for purchase transactions carried out through an electronic ordering transaction support system to be reflected in an agency's Financial Management Systems and communicated to suppliers for fulfillment (DOF, 2001).

Proposition 4: *The high degree of system integration is positively associated with the systems and technology implementation perspective of an e-Procurement initiative.*

Security and Authentication

Because of the sensitivity of the government data and the legal nature of orders and payments, security of data is critical in e-Procurement systems. The system must have mechanisms for identifying and authenticating the user who places an order so that the supplier knows it is safe to fulfill the order. In an e-Procurement environment, Birks *et al.* (2001) relate the security requirements at the e-Tendering stage to authentication, arguing that e-Purchasing systems and processes need protection because they involve a financial transaction and may be vulnerable to fraud. Stenning and Associates (2003) highlight the need for transactions between different systems to be exchanged in secure ways with absolute assurances regarding the identities of the buyers and suppliers. In order to encourage buyers and suppliers to engage in e-Procurement, it is critical that both parties have complete confidence and trust in the underlying security infrastructure.

Proposition 5: *The high degree of security and authentication is positively associated with the systems and technology implementation perspective of an e-Procurement initiative.*

Re-engineering the Process

e-Procurement should be viewed as an enabling mechanism to make the process of procurement more efficient in terms of cost, time, and achievement of value for money (ECOM, 2002). Where existing procurement practices and procedures may contradict the goals and objectives of the new initiative, the implementation of e-Procurement will require the re-engineering of existing purchasing processes (KPMG, 2001). Birks *et al.* (2001) note that roles and responsibilities might change substantially with the new process, which requires staff to adapt according to these.

According to the Stenning and Associates Report (2003), as a significant proportion of the benefits to be gained from implementing e-Procurement initiatives are related to the changes made through process re-engineering rather than the implementation of the e-Procurement initiatives themselves, existing processes for dealing with procurement will need to be revised. Birks *et al.* (2001) suggest that the process of reengineering should not only address process but also supplier relationships and all the internal groups affected by procurement.

Proposition 6: *The high degree of re-engineering of the process is positively associated with the practices and processes implementation perspective of an e-Procurement initiative.*

Performance Measurement

The continuous measurement of the key benefits is regarded as vital to the successful delivery of the business case. Measurement drives behavior and is a key to making the change a success (Birks *et al.*, 2001). Establishing goals and baselines is very important. According to CGEC (2002), a general lack of measurement capability ensures management has only limited tools for assessing organizational progress. It is important to define key performance indicators (KPIs) early in the process to enable successful benefits tracking and distil the business case into measurable KPIs. These KPIs should then be monitored throughout the project.

Proposition 7: *The greater level of use of the performance measures is positively associated with the practices and processes implementation perspective of an e-Procurement initiative.*

Top Management Support

There is little doubt that senior management leadership is critical to the success of an e-Procurement implementation (AGV, 2003). The top management team (steering committee) must involve the project manager, any consultants working with the committee, and agency staff to develop an implementation strategy (ECOM, 2002). In this regard, considerable attention and support need to be provided by senior management to ensure that the procurement reform has been well understood in the agency (S&A, 2003). Furthermore, the executive management team is responsible for setting the vision and goals, bringing about collective commitment for change in process and organizational structures, and formulating the policies and strategies necessary to put an e-Procurement initiative in place (WB, 2003).

Proposition 8: *The high level of top management support is positively associated with the organization and management implementation perspective of an e-Procurement initiative.*

Change Management Program

Changes required to support business processes are directly related to the speed of adoption of e-Procurement. With change management issues seeming to become more substantial as stakeholder needs increase (CGEC, 2002). The OGC (2002) recommends that increasing change in underlying processes requires more learning and effort on the part of users. Consequently, the OGC suggest more attention should be given to change management issues, citing three ways to achieve successful change management for e-Procurement: consultation, communication, and issue resolution (OGC, 2002). The World Bank Report cautions that while change management may be the least expensive aspect of an e-Procurement project, a lack of it can be a leading cause of project failure (World Bank, 2003).

Proposition 9a: *The high degree of change management program is positively associated with the organization and management implementation perspective of an e-Procurement initiative.*

Proposition 9b: *The high degree of change management program is positively associated with the practices and processes implementation perspective of an e-Procurement initiative.*

e-Procurement Implementation Strategy

The creation of documented and executable strategies prior to the deployment of the e-Procurement solution is an important CSF (Neef, 2001). This notion is further supported by the OSD Report (2001) findings that as the procurement strategy is intended to provide savings enabled by the technology, e-Procurement should be procurement-driven as well as technology-driven. Therefore, a clearly defined e-Procurement strategy not only emphasizes the importance of e-Procurement in the public sector but takes into consideration major institutional changes from the procurement process perspective as well as from the organizational perspective (WB, 2003). Another report (DOF, 2001) notes that the e-Procurement strategy should be based on the introduction of sound procurement practices while taking into account the differences in requirements of the public and private sectors.

Proposition 10a: *The greater level execution of e-Procurement implementation strategy is positively associated with the organization and management implementation perspective of an e-Procurement initiative.*

Proposition 10b: *The greater level execution of e-Procurement implementation strategy is positively associated with the practices and processes implementation perspective of an e-Procurement initiative.*

Communication Standards

e-Procurement requires various buyer-supplier systems to exchange information and electronic documents. This requires common standards. It seems that there is agreement emerging on the adoption of eXtensible Markup Language (XML) as the basis for standards (S&A, 2003). The XML standard defines the content in communication and in the selection of general data formats (KPMG, 2001). In defining e-Procurement requirements, Birks *et al.*, (2001) claim a key concern is the standard for formatting electronic catalogues. The World Bank (2003) suggests that developing an e-Procurement system in an open environment allows it to link to other systems for interoperability and simplifies upgrading the

system. According to the DOF (2001), successful introduction and adoption of e-Procurement in the public sector also depend on the ease with which procurement-related data can be exchanged both within the agencies and between their supply bases.

Proposition 11: The high level of communication standards is positively associated with the systems and technology implementation perspective of an e-Procurement initiative.

As discussed above, it is the implementation perspective that links the CSFs and determines the impact of each implementation factor to the success of an e-Procurement initiative. It is thus necessary to put forward further propositions as follows:

Proposition 12: The high level impact of organization and management implementation perspective on the e-Procurement initiative is positively associated with the (i) high level user satisfaction, and (ii) high level supplier satisfaction.

Proposition 13: The high level impact of systems and technology implementation perspective on the e-Procurement initiative is positively associated with the (i) high level user satisfaction, and (ii) high level supplier satisfaction.

Proposition 14: The high level impact of practices and processes implementation perspective on the e-Procurement initiative is positively associated with the (i) high level user satisfaction, and (ii) high level supplier satisfaction.

Proposition 15: The high level success of an e-Procurement initiative is positively associated with the (i) high level user satisfaction, and (ii) high level supplier satisfaction.

Table 2 presents some attributes for each CSF as discussed above. A review of the literature indicates that there is no research directly related to the topic of e-Procurement CSFs. So, the proposed CSF model will be used as the basis for future research with the ultimate goal of validating the propositions and developing and testing hypotheses from the propositions.

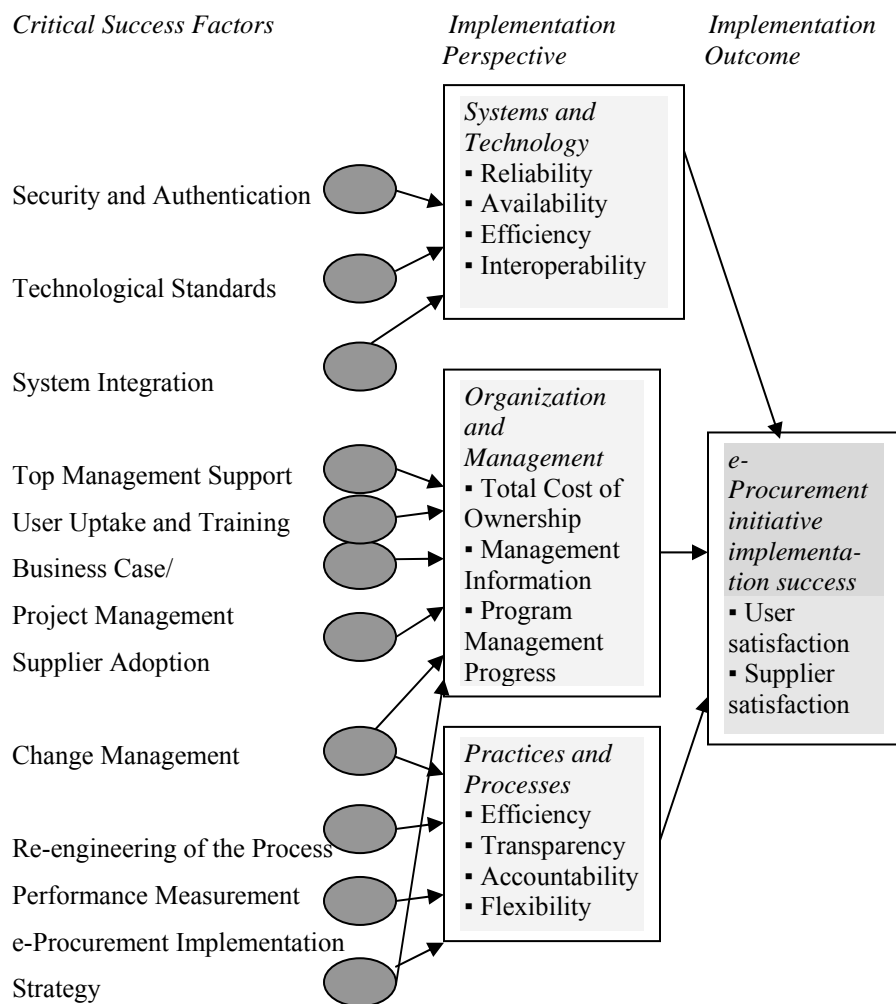
The research model (Figure 2) is a representation of the CSF model and permits the development of propositions to answer the research question. Based on the parameters defined by the literature review

TABLE 2
CSF Item Attributes

CSF (Variable)	Item attributes	Literature Support
1. End-users Uptake and Training	User involvement, user support/communication, user training	KPMG (2001), OGC (2002), AGV (2003), CGEC (2002), WB (2003)
2. Supplier Adoption	Supplier e-readiness, supplier adoption strategy and communication plan, suppliers education and benefits demonstration, compliance to best practices with content and catalogue management	OSD (2001), Birks et. al (2001), S&A (2003), ECOM (2002), Subramaniam and Shaw (2002)
3. Business Case and Project Management	Identification of business drivers, business process assessment and requirement, Return on Investment (ROI), Total Cost of Ownership (TCO), risks identification and management, pilot projects	Birks et. al (2001), AGV (2003), AOT (2003)
4. System Integration	Information matching, sending and receiving of real time information to other information systems, electronic commerce with suppliers	DOF (2001), Birks et. al (2001), S&A (2003), Subramaniam and Shaw (2002)
5. Security and Authentication	Infrastructure authentication and authorization, confidentiality and integrity, security requirements	DOF (2001), DOIR (2001), PLS-Ramboll (2000)
6. Re-engineering the Process	Transparency improvement, automated invoice payment and reconciliation, compliance with purchasing procedures and standard	OGC (2002), OSD (2001), WB (2003), KPMG (2001)
7. Performance Measurement	Goals and targets, Key performance Indicators (KPIs), baseline measurement, progress monitoring	CGEC (2002), DOF (2001), OSD (2001), AOT (2003)
8. Top Management Support	Management sponsor, involvement of the steering committee, investment in organizational change	S&A (2003), AGV (2003), OGC (2002), CGEC (2002), AOT (2003)
9. Change Management	Identification and management of key stakeholders, e-Procurement impact assessment, potential barriers to implementation, organizational resistance	Birks et. al (2001), DOF (2001), OGC (2002), OSD (2001), WB (2003)
10. e-Procurement Implementation Strategy	Sound procurement practices, opportunities for aggregation, a consistent approach to procurement, relationships with industry and small businesses	DOF (2001), DOIR 2001, ECOM (2002), PLS Ramboll (2000)
11. Technology Standards	Technical standards, content standards, process and procedural standards, compliance with the standards frameworks, interoperability	DOF (2001), S&A (2003), WB (2003), AOT (2003), KPMG (2001), Koorn <i>et al</i> , (2001)

Source: Original table.

FIGURE 2
A Research Model of e-Procurement CSFs



Source: Original figure.

discussed in this paper, the model presents performance measures for each category of implementation factor. The model also shows the impact of the implementation factors on the success of an e-Procurement initiative to be determined by the user and supplier satisfaction levels.

E-PROCUREMENT IMPLEMENTATION PERSPECTIVES AND OUTCOMES

e-Procurement solutions are seen as a way to address many public sector procurement requirements. It has become apparent that the more the procurement process is supported by Internet technology, the easier it will become to develop and implement e-Procurement. The e-Procurement infrastructure and procedures can facilitate the achievement of the principles including transparency and accountability requirements of the public offices while enhancing efficiency, effectiveness, and flexibility in the procurement process (DOFA, 2002). e-Procurement has the potential to promote operating efficiency in public sector procurement and provide significant cost savings (OCIO, 2000). One of key logical advantages of electronic transaction management is that it frees procurement staff for procurement evaluation and contract management roles. Furthermore, management information can be extracted from the e-Procurement system using standard reporting software (OGC, 2002). The transparent management information provided by e-Procurement also permits the monitoring of compliance with service level agreements and measurement of many other elements of supplier performance (OSD, 2001).

The implementation of e-Procurement initiatives should be seen as an effort to improve the procurement goals, which normally include quality; timeliness; cost; minimizing business, financial and technical risks; maximizing competition; and maintaining integrity (Thai, 2001). In a similar vein, CGEC (2002) has identified cost, quality, program management progress measures (on-time, on-budget, and issue management), process performance factors, and Return on Investment as the most relevant measurements. There remains, however, the challenge of controlling the range of variables required to reap the benefits of e-Procurement implementation. It should be remembered that because an e-Procurement initiative is expensive, demanding upon staff, and time consuming, it may take several years for public sector agencies to fully reap the strategic and operational benefits of e-Procurement.

ANALYSIS OF THE RELATIVE IMPORTANCE OF CRITICAL SUCCESS FACTORS

Analysis of the critical success factors through the use of citation frequency as a measure of their importance revealed that among the eleven CSFs, no one single factor was overly predominant. In order to further understand the relative importance, the CSFs were split into two categories: human factors and technology factors. Human factors are those issues dependent on human behavior and expertise while technology factors are those issues dependent on construction and deployment technologies. Human factors consist of end-user uptake and training, supplier adoption, business case and project management, and top management support. Technology factors consist of system integration and security and authentication. Change management, e-Procurement implementation strategy, process re-engineering, performance measurement, and technology standards are factors that involve aspects of both categories.

While this type of analysis is subjective, the prominence of human factors in the success of e-Procurement implementations is apparent. This suggests that where there is a conflict between human and technological issues, the returns on e-Procurement initiatives may be higher if more attention is given to the human issue.

CONCLUSIONS

This paper surveyed a number of specialized reports on e-Procurement initiatives in the UK, US, and Australian public sectors readily available to practitioners and decision-makers. The survey was a conceptual model showing a number of unique factors regarded as instrumental in the success of public sector e-Procurement implementation. For example, it was found that e-Procurement projects have a greater reach and scope than traditional IT development projects. Security and controls, and standards and interfaces emerged as more important requirements than those in other IT projects. Key differences in the approach to the development of e-Procurement projects were also noted during the study. Interestingly, the legal and legislative issues did not emerge as CSFs, although factors such as top management support and performance measurement were found to be critical projects.

Another key difference was that e-Procurement projects tend to be more incremental and component-driven and thus rely less on traditional

systems development life cycle (SDLC) methods. Instead, developing business cases and undertaking pilot projects were found to be more common practices in e-Procurement projects. As the management of e-Procurement projects includes the involvement of a significant number of internal and external stakeholders (i.e., buyers, end-users, suppliers, service providers, consultants, an individual seller, and sponsors), the importance of stakeholder involvement cannot be under-estimated. This conclusion is drawn from the findings of this study that user uptake and training turned out to be the most important factor followed by supplier adoption. These insights are consistent with Subramaniam and Shaw's (2002) view that e-Procurement systems are different from traditional IT systems in many ways and there is a need to develop new concepts that help information systems researchers better evaluate e-Commerce impacts.

This paper also discussed some measures for the success of an e-Procurement implementation initiative to be determined by measuring user and supplier satisfaction. It became apparent from the literature that public sector e-Procurement initiatives must also focus on interoperability, transparency, and accountability issues.

Although the introduction of e-Procurement has created a lot of enthusiasm in the press, this study indicates that many public sector agencies are still at an early stage of implementation. Evidence in relation to the implementation of e-Procurement initiatives indicates that this transition is turning out to be a major challenge for many public sector agencies at a time when governments worldwide are focusing on e-Procurement as part of their e-Government agenda. Once the CSFs are selected, it is critical to identify the measures of their success. Given the assertion that the human factors play a more important role than technological factors in the successful implementation of e-Procurement initiatives, the findings of this study may assist senior procurement professionals and e-Procurement project managers in the public sector to establish a system of progress assessment and decision-making in regards to their e-Procurement initiatives. As one of the aims of the paper was to stimulate debate and generate feedback, the model presented is not a prescriptive CSF model. Nevertheless, this study also provides input to new theory development by proposing a "starting point", for future research. A focus on reliable CSFs can help reduce the time required for e-Procurement implementation and result in economic

benefits for an organization in line with its strategic and operational objectives.

While the use of in-depth case studies of e-Procurement initiatives in the public sector would have suited the research purpose of this study, time and financial restrictions limited the study to multiple case studies by literature survey to identify major cases in order to develop a set of CSFs. As such, it is essential that the research continues in order to further validate the observations of this study. In the next phase of this study, semi-structured interviews on public sector e-Procurement project managers will be carried out to capture the perspectives of interviewees. The results of this enquiry will be used to refine the CSF model and variables relating to each implementation factor and thus develop further hypotheses. The hypotheses for future research will also stem from multiple case studies, which will be tested by means of survey questionnaires distributed to public sector agencies. The surveys will help to evaluate the extent and criticality of the CSFs, the implementation factors, and associated variables. It would be useful to identify the specific performance measures for each CSF in terms of quantifiable indicators.

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