

Impact of E-Procurement: Experiences from Implementation in the UK Public Sector

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Abstract

The advent of the Internet as a business systems platform has been a catalyst for major changes in the operation and status of organizational procurement. Early e-procurement literature forecast significant improvements in procurement costs, an improving status of the purchasing function, and changes to the structure of supply markets. Our study seeks to evaluate the validity of these forecasts through the development of a structural model of the 'e-procurement effect'. This model is intended to define the dynamics of the e-procurement process in an organization and provide a foundation for a research stream into the transformational effect of e-procurement deployment.

The article presents the evaluation of e-procurement implementation and operation from an eighteen month study of e-procurement deployment across nine UK public sector organizations. The article explores five key themes in e-procurement, namely system specification, implementation management, changes to organizational characteristics, changes in total acquisition costs, and changes to governance structures.

Our analysis suggests that the proposed structural model of the e-procurement effect is broadly applicable and that many of the previous claimed benefits in the literature can be realised. We also contend that an important variable for the success of e-procurement adoption is to address the internal service quality attributes of e-procurement processes – a topic which offers significant scope for future research.

Keywords: electronic procurement; internal service; structural model

1. Introduction

As noted by Nelson *et al.* (2001), purchasing accounts for the majority of organisational spending. As such, the advent of web-based electronic procurement has been heralded as a 'revolution' because of its potential to reduce the total cost of acquisition (Croom, 2000; Essig & Arnold, 2001; de Boer *et al.*, 2002, Wyld 2002; Rai *et al.* 2006). It is also expected to impact on the nature of supplier governance, either reinforcing market-based relationships (Malone *et al.* 1989; Barratt & Rosdahl, 2002) or encouraging virtual hierarchies (Brosseau, 1990). Finally, the e-procurement revolution is expected

to enhance the status and influence of the purchasing function within organizations (Croom, 2000; Osmonbekov *et al.*, 2002).

Much of the e-procurement literature to date has (naturally) focused on early adopters. The particular areas of interest in these studies relate to system implementation, identifying efficiency effects, speculating the potential changes in supply chain configuration that may occur, and positing that e-procurement will have a major impact on the function by leading to its outsourcing or conversely raising its strategic role.

Using a case-based approach, our study explored the issues relating to implementation

and impact of e-procurement. The objective was to inform the development of a conceptual structural model of the key decision variables, mediating variables and outcomes from the e-procurement process. In this respect the paper is a 'theory in development', intended to inform not only our on going research (Croom, 2000; 2001; 2005; Croom & Johnston, 2003; Croom & Brandon-Jones, 2005), but also the work of others in the field.

Our study investigated a number of UK public sector e-procurement programmes at both local and national government levels. Since this study originated as a commissioned investigation for a UK government body, all names and some data have been disguised due to issues of confidentiality.

2. E-Procurement Research

Electronic procurement refers to the use of integrated (commonly web-based) communication systems for the conduct of part or all of the purchasing process; a process that may incorporate stages from the initial need identification by users, through search, sourcing, negotiation, ordering, receipt and post-purchase review.

A review of the literature to date identifies five main themes in e-procurement relating to:

- Changes to total acquisition costs
- Changes to organisational characteristics
- Changes to governance structures
- System specification
- Implementation management

2.1. Changes to Total Acquisition Costs

Existing literature has emphasized the important contribution of e-procurement in reducing total purchasing costs. These benefits broadly arise through lower prices from suppliers and reduced costs in the 'requisition to payment' process (Croom, 2000; deBoer *et al.*, 2002; Wyld, 2002; Kameshwaren *et al.* 2007; Mishra *et al.* 2007). Whilst it has been widely contended that e-procurement will have considerable implications for the design of the procurement process, Lancioni *et al.* (2000) note that the precise nature of these changes remains unclear. Yen & Ng (2003) carried out a case study investigation of textile and apparel e-commerce implementation in Hong Kong. Although primarily interested in the system roll-out process, they provide a useful comparison of pre-

and post- e-procurement process performance. Their case evidence gives some useful description of the changes to the procurement process and supports the claims from prior literature that such changes deliver significant efficiencies. They highlight the reduction in costs arising as a result of 'digitizing' catalogues, fewer errors in order transmission, reductions in inventory, and minimizing suppliers' marketing costs.

In the practitioner and general management literature there is a plethora of anecdotal case evidence to support the view that e-procurement is a far more efficient and reliable method for the requisition-to-payment process than manual or semi-automated processes. However, the speed of adoption and implementation has widely failed to reach the forecasts made by commentators. (Wheatley, 2003; Quale, 2005).

2.2. Changes to Organizational Characteristics

The e-procurement literature has also examined the nature of behavioural and relational changes to organizations and their supply chains as a result of adoption. In a study of the motivation of buyers to use the internet as a resource for various elements of the purchasing process, Kennedy & Deeter-Schmelz (2001) conclude that 'organizational characteristics and organizational influences' are significant motivators to the use of e-procurement. In other words, the extent to which e-procurement is used and developed is strongly influenced by the general disposition of the organization as a whole. The relationship between user perceptions and the level of compliance has been noted by a number of authors (de Boer *et al.* 2002; Croom & Johnston, 2003; Interfaces, 2006). The broad argument by these authors is that in order to achieve improvements in performance, internal customer satisfaction should be a key concern in the development, adoption and deployment of e-procurement.

2.3. Changes to Governance Structures

The influence of improved information transmission and user access to the procurement process through the adoption of e-procurement has a significant impact on the configuration and structure of supply chains. Croom (2001) notes that the literature posits two opposing schools of thought on the subject

On one side, they may increase the tendency towards market transactions as the barriers to

participate in electronic transactions diminish. Malone *et al.* (1989) argue that inter-organizational electronic networks improve coordination between firms to reduce the costs of searching for appropriate goods and services - "electronic brokerage effects". Consequently, they claim that one of the major effects of inter-organizational networks would be a shift from hierarchical to market relationships. Barratt and Rosdahl (2002) argue that ease of search and transparency acts as an advantage to the buyer but may be a disadvantage for the seller, which further reinforces market-based relationships under e-procurement.

On the other side, it has been posited that the proprietary nature of some inter-organizational systems may in fact serve to tie in customers and suppliers into virtual hierarchies (Konsynski & McFarlan, 1990). Brousseau's (1990) review of 26 inter-organizational networks shows that most serve to reinforce already existing hierarchical relationships among firms. Only in two, the petroleum business and textiles, was the use of inter-organizational networks associated with buyers gaining advantage by having more suppliers from which to choose. Evans and Wurster (2001) claim that the low infrastructure and transaction costs of Internet-based systems allow organizations to exploit the increased opportunities for complex information exchange with multiple partners, but also recognize the value to be gained through closer, hierarchical, relationships between regular trading partners ('affiliation'). Amit and Zott (2001) likewise discussed the importance of close relationships ('lock-in') between trading partners as a key source of advantage to both buyer and seller.

In considering how e-procurement will impact on buyer-seller relationships, Carr & Smeltzer (2002) note that increased use of information technology between buyer and supplier does not improve levels of trust between buyer and seller. However, Ellram & Zsidisin (2002) argue that close buyer-supplier relationships have a strong positive impact on the adoption of e-procurement. Therefore, whilst e-procurement may not deliver improved levels of trust, it has been found that e-procurement transactions are more likely to be established first between partners in high trust relationships. Unfortunately, neither of these papers account for the evolutionary characteristics of buyer-seller relationships (Ford *et al.* 2003). In addressing this issue, both Croom (2001) and Kumar and Qian (2006) support the view that increased use of e-procurement and inter-

organizational systems enhance opportunities tend to create more effective customer-supplier relationships over time.

2.4. System Specification

System specification appears to be a critical issue in the uptake of e-procurement. The IDC report (2003) highlights the slow uptake of e-procurement systems, emphasizing some of the IS-related issues that inhibit implementation, including software integration.

The extent to which an e-procurement system is able to integrate effectively with other information systems, particularly production planning & control and finance systems, is posited by Subramaniam & Shaw (2002) to be a major causal determinant of the efficiency and effectiveness of an e-procurement system. Rajkumar (2001) also identifies system integration as a critical success factor for e-procurement implementation, both with the customer's information infrastructure and in its links to suppliers.

Lin & Hsieh (2000) use a single case study to highlight the importance of both web content management and content rationalization as significant issues for e-procurement operation. They note that constantly changing prices, specifications and account details across the supply base cause major problems in the maintenance of supplier catalogues. In addition, the way an item is described (item coding) is noted as a significant data management issue for e-procurement.

2.5. Implementation Management

There are relatively few detailed empirical studies of e-procurement implementation. Mc Manus (2002) examines the rate of e-procurement implementation in the US public sector, remarking that motivation for implementation was based on expectations of lower purchase prices, reduced transaction costs, and increased speed. She also notes that the implementation of e-procurement had led to increased debate about some of the fundamental principles behind public sector procurement, including 'lowest bid wins', separation of vendor and user, preference for fixed price/fixed term contracts, and transparency of public accountability. A case example of Taiwanese military procurement by Liao *et al.* (2003) documents the challenges for e-procurement implementation in terms of changing established

procurement practices and particularly highlights the significance of 'human deficiencies and faults (i.e. corruption and inefficiency) in the implementation process.

Heijboer (2003) recognizes that governance effects of e-procurement are subject to the dynamics of e-procurement roll-out, and he proposes an analytical model based on both the structural (i.e. internal overhead and process costs) and the ROI resulting from the e-procurement roll out on a commodity-by-commodity basis. Thus, the nature of governance structures should perhaps not be seen merely as a static phenomenon. Instead, the strategy predicated on gathering 'low hanging fruit' may dictate the pattern and nature of governance changes.

2.6. A Priori Model of E-Procurement Effects

In designing our research protocol, we were careful not to make assumptions about the relationship between each of the elements discussed in the literature. However, it was useful to structure our research on an *a priori* model (Figure 1) constructed on the foundations of early e-procurement literature. This model primarily helped us to develop research questions and delineate the phenomena with which the study would be interested. Further, it provided the basis for developing a more comprehensive model of the 'e-procurement effect'.

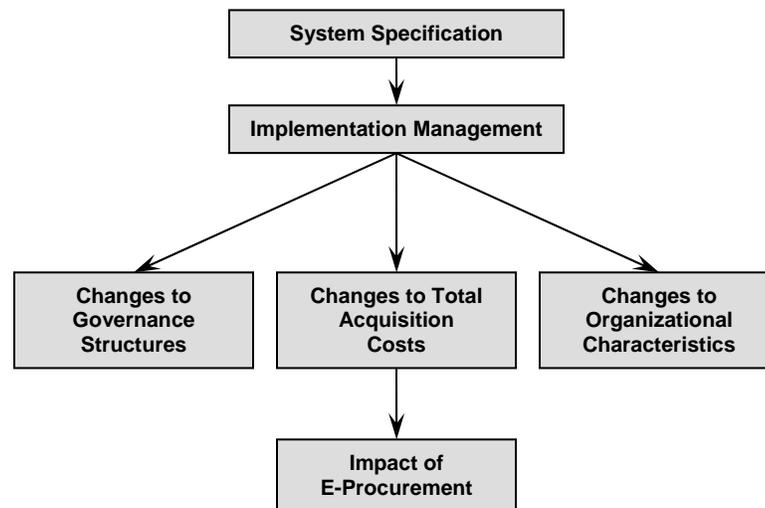


Figure 1: An *a priori* model of e-procurement effects

3. Study Background & Methodology

3.1. Study Design

Given the relatively tentative nature of many of the conclusions in existing literature, our research set out empirically to examine e-procurement implementation. The research was commissioned by a UK public sector agency to review the experiences and results of e-procurement systems implementation. It involved nine different public sector organizations responsible for a wide range of services and activities. Two of the nine organizations were government agencies with responsibility for e-procurement development

and services to central and local governmental bodies. All of the organizations involved had experience of e-procurement systems implementation, ranging from ten years (using a network database system) to a matter of months (using internet enabled e-procurement). Furthermore, all respondents were engaged, to varying degrees, with the deployment of procurement cards.

3.2. Data Collection

Our research was carried out in two phases. Phase 1 involved 14 interviews with senior managers across government departments, local authorities and several coordinating departments.

These semi-structured interviews, typically lasting an hour, revolved around the following themes:

- Changes to total acquisition costs arising from e-procurement implementation; achieved and expected benefits of using e-procurement; experienced impediments to further implementation.
- Changes to organisational characteristics; user perceptions of e-procurement and attitudes towards the purchasing function.
- Changes to governance structures; supplier relations and existing supply strategies
- Approach to system design; systems interface issues
- Implementation management; project protocol; roll-out strategy

- E-procurement support provision; day-to-day delivery.

Following completion of the initial round of interviews, a summary analysis of findings and pertinent issues was circulated to all participants as the basis for the second phase of interviews.

Phase 2 involved 27 semi-structured interviews with senior managers and team leaders, employing a critical incident method to identify key successes and barriers to e-procurement implementation. All interviews were taped and transcribed verbatim. Coding of transcripts was undertaken by both researchers independently and then cross-checked for final coding. Figure 2 provides a summary profile of those involved in the study.

This article provides the summary findings from our analysis. Unfortunately, the consequence of being given confidential access to projects and organizations is that we are unable to include some commercial data.

Profile of respondents			
Cross-departmental agency	2		
Financial services	2		
Security services	2		
Public services	1		
Infrastructure services	2		
E-Procurement Experience	< 3 years	3 - 5 years	> 5 years
	4	2	3
Research Design	Interviews	Method	Structure
Phase 1	14	Telephone / face-to-face	Semi-structured
Phase 2	27	Face-to-face	Semi-structured / critical incident

Figure 2: Summary Profile

3.3. Data Analysis

The objective of our analysis was to refine the *a priori* causal map of 'e-procurement effect'. Considerable emphasis in interpretive research is given to the constant comparative method of qualitative analysis, which involves extensive use of data coding (Glaser & Strauss, 1967). In the first instance, this involves identification of variables of interest from the transcripts, notes, documents and classification of such variables. This provided us with 'open' codes in the initial stage of the coding process. Iterative comparison of open codes was used to generate 'axial' codes, which are key to the identification of those variables determined

to be core to the effective deployment of e-procurement.

4. Findings & Discussion

In this section we have set out our findings in five sections, which relate directly to the five themes identified in our review of the existing e-procurement literature. The objective is to provide a clear link between our study findings and the existing literature.

4.1. Changes to Total Acquisition Costs

In discussing the efficiency benefits of e-procurement, our analysis identified two main areas of benefit which appeared to be achieved

through e-procurement implementation – process cost improvements and purchase price reduction.

Firstly, we found that the costs associated with the procurement process were significantly reduced. The literature identifies processing cost reduction as a significant benefit of e-procurement adoption, yet few of our participants had actually been able to validate savings per transaction. Typically, the cost-per-order was *estimated* to have fallen from an average of £70 to around £15. Process cost reduction occurred partly as a result of system specification (e.g. reduced transmission errors, process re-design etc.), but also through increased compliance to the approved process and contracts.

Secondly, due to the improved management information provided by the various forms of e-procurement systems we encountered, respondents reported that they had been able to consolidate requirements and improve their price negotiations with suppliers. The main routes for achieving clear accountable cost savings on purchases were through consolidation of specifications and suppliers and greater compliance with existing contracts. Our respondents commented that cost (price) savings were relatively easy for them to identify through invoice and budget data. Since e-procurement reduces the cost of search, increases access supply availability, enables real time control of spending, increases management information, and increases control, respondents perceived they had increased their leverage in buyer-supplier relationships.

a) Reduces search costs	b) Increases access to supply market
c) Consolidates requirements (reduced variety of purchases)	d) Increases leverage over purchase price
e) Reduces requisition-order process cost	f) Increases internal compliance with procedures
g) Cost per order reduced from £70 (\$140) to £15 (\$30) (est.)	

Table 4.1. Summary of e-procurement impact on acquisition costs

4.2. Changes to Organisational Characteristics

Process improvement has not been achieved simply through the implementation of new systems, but considerable effort and time had been necessary to train, educate and support users to ensure that systems are used correctly and problems are resolved speedily. The issue of compliance is an important one. Whilst price and process savings may occur simply through the implementation of e-procurement, the extent of user compliance is a vital mediating variable influencing changes to total acquisition costs.

'Maverick' or off process procurement has been noted by a number of authors (de Boer *et al.* 2002; Croom & Johnston, 2003; Reunis & van Raaij, 2006) and control over it is a key element in improving purchasing performance. In addressing this, one participating body had established a specialist training unit to support users in the procurement system roll out; two other departments held regular seminars for users and a fourth department established a specialist call centre providing comprehensive support for e-procurement system users. These approaches highlight the importance of day-to-day support provision in e-procurement implementation. We see 'support provision' as a new box in the e-procurement effects model influencing internal service and hence compliance.

The internal service aspect of e-procurement was a theme that recurred throughout our analysis and reflects the growing importance this issue is given in modern business (Bai *et al.* 2006; Seibert and Lingle, 2007). In this context, the perceived importance of the internal service dimension was threefold. Firstly, high levels of internal service had a significant effect on the likelihood of users to comply with e-procurement system. Secondly, a number of respondents reported an improvement in the status and reputation of the purchasing function, largely driven by the perception that the purchasing function was *facilitating* procurement rather than *inhibiting* it. Finally, internal service improvements were seen as important in improving the general disposition of the organisation as a whole to embrace e-procurement (Kennedy & Deeter-Schmelz, 2001; deBoer *et al.* 2002; Fredendall *et al.* 2005).

h) Establishment of specialized training unit.	i) 'Encourage' users to comply
j) Training seminars for users.	k) Improved accessibility for

	<i>users via e-procurement</i>
<i>l) Establish help centre</i>	<i>m) Enhanced status of purchasing function</i>
<i>n) Increased internal service perceptions</i>	

Table 4.2. Summary of e-procurement impact on organizational characteristics

4.3. Changes to Governance Structures

Suppliers' system compatibility has been recognized as a significant and major constraint

for widespread integration of e-procurement across the supply base (Salleh *et al.* 2006) and all of our respondents expressed concern that their supplier base had insufficient capability to fully engage in the integration of e-procurement. E-procurement systems typically include a significant dependence on the effectiveness of *dyadic* processes, requiring suppliers to have Internet access and appropriate systems to receive data from the customer. Croom (2003; 2005) identified a variety of alternate (generic) forms of governance structures through which customer-supplier communications can take place (Fig 3).

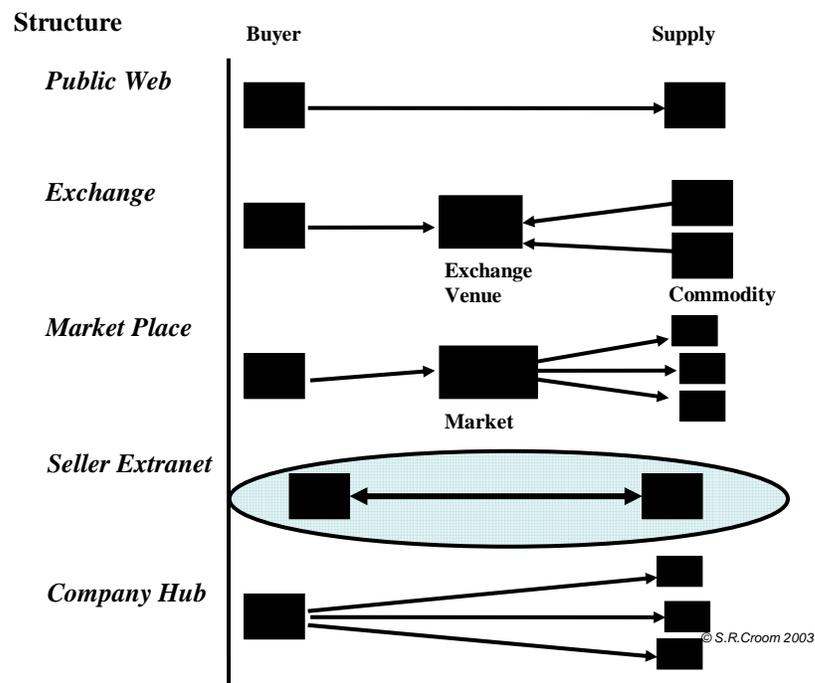


Figure 3: E-Procurement transactional structures (Croom, 2003; 2005)

All of the study respondents used variations of the 'company hub' (a.k.a. 'buy-side') archetype in which catalogues and ordering systems are hosted by the customer. However, organisations reported very different levels of supplier capability for participation in e-procurement. In the case of one of the Agencies involved in this study, participation in the e-procurement process was mandatory for all suppliers, which consequently enabled a far wider deployment of e-procurement than other departments had been able to achieve. Since this Agency was able to transmit its orders by a range of different media

(including email, fax, letter, spreadsheet, and XML file), it was a far more inclusive system for their suppliers.

The forms of transactional structure adopted impacts upon a number of key aspects of the buyer-supplier relationship. Respondents reported that the opportunity to improve contract compliance through the increased volume of orders placed using the e-procurement system had offered much greater 'leverage' over suppliers' pricing and improved the accuracy of supplier delivery to order. Through opportunities to adopt various forms of electronic sourcing,

purchasers reported that they believed they had achieved a far more 'transparent' (i.e. accountable) sourcing process. Finally, e-procurement systems were not viewed simply as catalogue and ordering systems, but provided opportunities for much more communication and knowledge sharing with supply partners.

In respect of governance and supplier relationships, our study reinforced the contentions made in existing literature that e-procurement has the potential to enhance leverage and improve transparency in supply management, not least through greater consolidation of purchases (Narasimhan and Das, 2001). We found the majority of respondents had reduced their supply base and had a closer relationship with those remaining. This suggests a move towards virtual hierarchies and reinforces the idea of 'lock-in' discussed by Amit and Zott (2001). In line with Ellram and Zsidis (2002), we found that whilst e-procurement is not a pre-requisite for closer relationships, e-procurement transactions tended to exist with suppliers who were well known and trusted. As such, our analysis supports the view that e-procurement has the potential to enhance rather than damage customer-supplier relationships.

<i>o) Improved communication with suppliers.</i>	<i>p) Transparency of sourcing and supply processes</i>
<i>q) Increased compliance by suppliers</i>	<i>r) Improved aggregation of demand</i>
<i>s) Supply base reduction</i>	<i>t) Greater knowledge sharing with suppliers</i>

Table 4.3. Summary of the e-procurement impact on supply governance

4.4. System Specification

In line with existing literature (Rajkumar, 2001; Subramaniam & Shaw, 2002), system specification was found to be critical to the operational performance of the e-procurement system. Two key themes emerged relating to specification – systems integration and data management.

As posited by Subramaniam and Shaw (2002), the degree of integration with existing organizational systems was considered to be a key decision for the development and

implementation of an e-procurement system. Significant constraints faced by organizations when defining their e-procurement system specification include: multiple legacy systems (particularly the proliferation of multiple finance and purchasing systems); complexity arising from different requisition, order and payment processes; confusion surrounding differing data formats; high degrees of variation in the communication channels used to transmit data; and the variability of detail in management reports.

Since the procurement process incorporates financial activities (payment, budget/cost code allocation, authorization of expenditure), e-procurement systems were not seen as independent, stand alone projects and all respondents commented that their e-procurement initiatives were seen as an integral element of their organization's information strategies. Consequently, procurement system specification was closely linked to broader, strategic IS investments. Integration was seen as a critical concern in the choice of platform for four of the participants.

All of the large departments involved in our study stated that their choice of e-procurement provider had been determined by their current or intended choice of finance system provider. The decision to utilize the e-procurement modules of existing finance or ERP systems such as Oracle and SAP taken by 4 of the 9 case organizations was dictated by the perceived benefits for integrating information flows. In the case of the two agency organizations, both had developed large scale 'B2B marketplaces' to serve other public sector bodies. Yet again, they needed to be able to integrate with a range of legacy finance systems principally through the development of bespoke file transfer software and the development of specialist programs to allow upload of data between systems. Three key organizational infrastructure barriers to roll-out were identified: Hardware resources – for example not every potential internal user may have appropriate PC access; Network resources – particularly in terms of both access across security 'firewalls' and high speed links; Web server issues – increasing the reliance on distributed and network systems places increased demand for the physical space and technical support needed to maintain network service.

Data management concerns were found to be important, both in terms of entry and the coding schema employed. Inaccurate data entry often

arose as a result of the complexities caused by multiple entry points and inconsistent product coding (Lin & Hsieh, 2000). In only two organizations was a standard coding schemata employed to ensure commonality across all users. Attempts to avoid inaccurate data entry include the deployment of a centralized data entry team by one organization and the development of 'flat files' (two dimensional databases) and data sheets by both of the agencies involved in the study. Similarly, catalogue management and maintenance was seen as a vital area to ensure consistent and accurate information in e-procurement systems.

In the management of the procurement process, most organizations were faced with limited levels of management information concerning expenditure, product and service specifications and supplier information. One stated that they had previously depended on suppliers to provide certain management information due to lack of internal sources of information. With the deployment of e-procurement, considerable improvement in the level of management information and management knowledge was cited as a major strategic improvement for the function. Pressed further, respondents expected better information to lead directly to more effective purchasing and supplier relationships.

u) <i>High concern for integration with existing systems</i>	v) <i>Improved control over management information</i>
w) <i>Data management a key 'back office' activity</i>	

Table 4.4. System specification issues related to e-procurement adoption

All of the participants in our study had established project teams to manage development and implementation. The process was found to follow one of two contrasting project management approaches, or protocols, according to the systems development strategy adopted. One approach we classified as an informal, 'evolutionary' protocol and the other we classified as a formal 'project board' protocol.

The evolutionary protocol involves internal design and development of a bespoke system, which consequently involved gradual system development and roll-out. The evolutionary protocol was adopted by both of the agency organizations involved in this study, both of

whom are quasi-third-party developers for e-procurement software. However, we also found the 'evolutionary protocol' being employed by organizations where internal expertise and knowledge relating to the technical aspects of e-procurement systems existed. The 'project board protocol' was typically employed by large organizations who undertook a formal appraisal and sourcing approach to the purchase of a third-party e-procurement system, such as the SAP enterprise buying module.

We found that significant benefits accrue from aspects of both the 'evolutionary' and 'project board' protocols. An evolutionary protocol allows for gradual development, greater screening and helps to build the organization's knowledge relating to the e-procurement process. It also develops considerable expertise in the project team. In the project board protocol, inclusion of major functions such as finance, audit and HR ensure that key stakeholders of elements of the procurement process are 'on-side' and participate in process improvements. Given the potential conflict that can exist between functions, particularly finance and purchasing, an inclusive project management structure offers major benefits for effective development. An inclusive approach also gave more attention to systems integration issues in the choice of e-procurement platform - all of the participants who opted for the e-procurement module from the existing finance/ERP provider had a high level of involvement from finance, audit and HR in their project team.

We hypothesize that the approach to project management is contingent upon a number of factors, namely the degree of internal systems expertise, size of the organization and existing management control systems (e.g. finance and ERP systems). Unfortunately, our current study was not of sufficient scale to support any statistical testing of such hypotheses and we therefore propose that future research may set out to test the relationship between project management protocol, organizational context and nature of the e-procurement infrastructure.

x) <i>'Evolutionary protocol' appropriate where high levels of technical expertise already in-house</i>	y) <i>'Project board protocol' appropriate in situations with cross-functional stakeholders</i>
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Table 4.5. Approaches to e-procurement project management.

4.5, Implementation Management

The roll-out of the e-procurement system across the supply base was typified by one of two distinct strategies. The most popular methodology involved a limited roll-out to the organization's top 5 suppliers. This was often the case in small organisations or when a large percentage of spending was focused on a few suppliers. A second cluster of organizations had undertaken a total supply base roll-out. This approach was used in the larger organisations and where e-procurement was more well-established. All of our respondents initially targeted a small group of users and suppliers for their pilot implementation, from which the next phase of development was to increase the number of users and then the number of suppliers. This approach contrasts sharply with Heijboer's (2003) proposals that roll-out should be focused on *commodity* groups.

z) 'Commodity roll-out' not applied in the cases analyzed	aa) 'Supply base roll-out' typically adopted, starting with small group of suppliers and users
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Table 4.6. Approaches to e-procurement roll-out

In delivering an e-procurement system to end-users, we see the importance of both system specification and implementation management. The former is concerned with issues of software integration, data management, and the make-up of the project team. The latter is focused on how an e-procurement system, once designed, is delivered to users and an organization's supply-base.

5. Conclusions and Implications

This paper has provided an overview of the main findings from our study of e-procurement in nine public sector organizations. The intention here has been to examine the impact of e-procurement implementation and operation on organizational processes and performance in order to develop a model of the 'e-procurement

effect' (Fig 4). This model draws on the initial summary findings from our case analysis and cross references the various summary factors indicated in the previous section.

The e-procurement effects model outlines the main causal variables in implementation which impact on e-procurement performance. Naturally, the model is a relatively simple schematic at this stage, but serves to provide insight into the dynamics of the process through which we have seen e-procurement drive change.

Considering how e-procurement implementation influences governance structures, we found evidence of reduced search costs leading to increased supply availability, and hence greater leverage in negotiation. We also saw an increased level of communication driving knowledge sharing between customers and suppliers. Therefore, rather than see a move towards increased market-based relationships (Barratt & Rosdahl, 2002), we found that e-procurement tends to reinforce existing hierarchical relationships among firms (Brousseau, 1990).

We also found evidence of the impact e-procurement implementation has on the total cost of acquiring goods and services. The cost of processing purchase requisitions was reduced through improvements to the procurement system, but also the reduction in maverick purchasing. Price reductions accrued from increased visibility, compliance, management information, demand aggregation, and increased leverage in negotiations.

When considering the affect of e-procurement on organizational characteristics, the most significant issue to emerge from our study was the role of internal service in e-procurement. Our analysis suggests that the reputation of the procurement function and the general disposition of an organisation towards e-procurement is strongly influenced by users' perceptions of internal service. Whilst we supports the view that e-procurement implementation creates the potential to improve compliance, it is clear that compliance is far from 'given'. The extent to which internal users are provided with support to use e-procurement appears to have a significant effect on maverick spending.

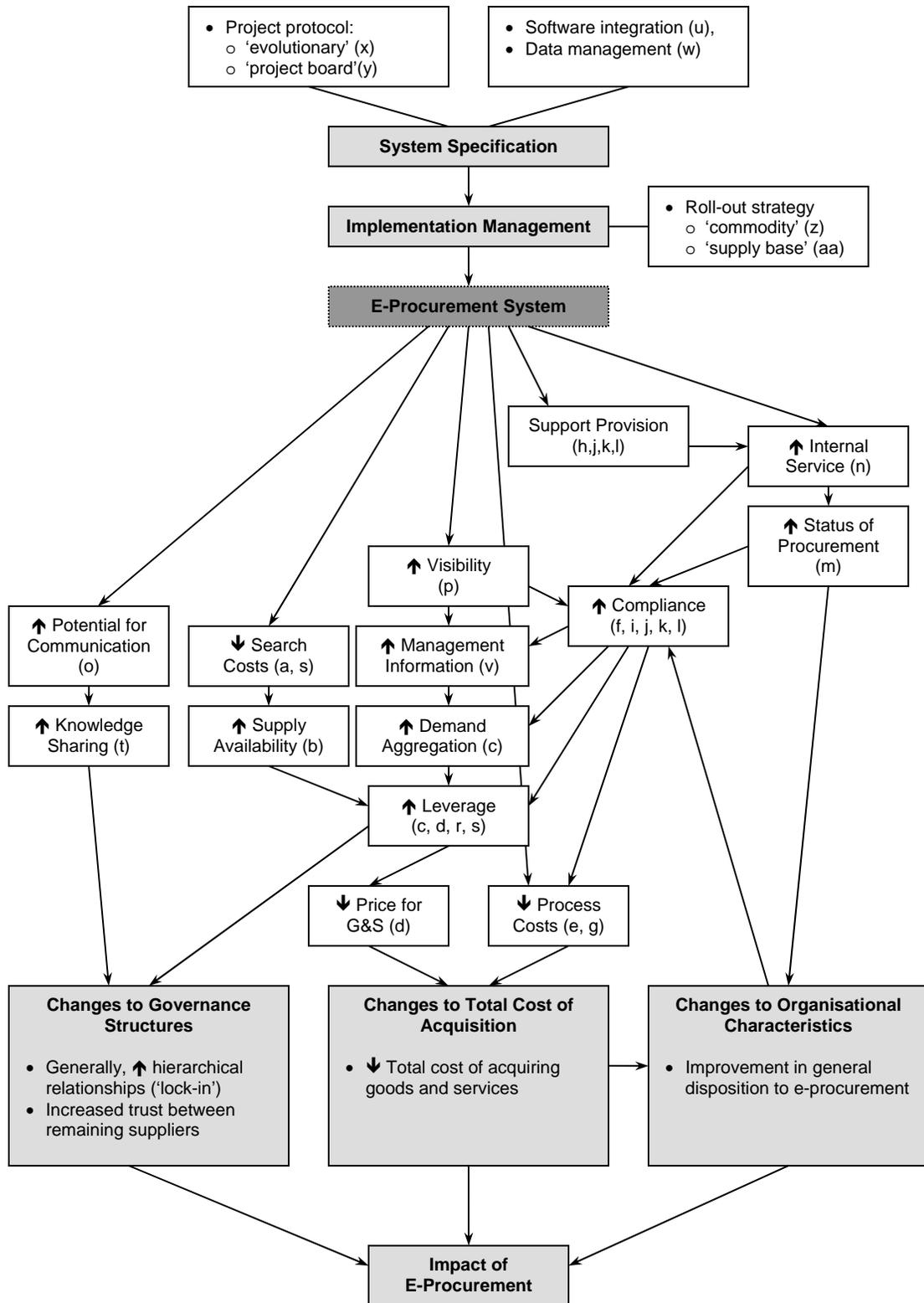


Fig 4: E-procurement effects model

As a practical implication, managers should question the extent to which they can 'force' individuals to use e-procurement and focus instead on delivering e-procurement in a way that 'encourages' its use.

E-procurement was heralded in the literature pre-2000 as offering significant opportunities for the purchasing function and the procurement process. This paper has explored some of the operational issues surrounding implementation and roll-out in order to provide further insights to the debate in this area. It has allowed us to develop greater understanding of the factors at play in delivering the benefits attributable to system adoption and deployment.

To improve our understanding of the mechanisms and processes by which these benefits are gained, this article presented an e-procurement effects model as a foundation for ongoing research into e-procurement implementation. We believe that this model will serve as a basis for classifying existing e-procurement research and directing future collaborative and comparative work in the area.

6. Future research

By proposing a structural model of the 'e-procurement effect' we hope to provide a basis for future research development. Our current work is focusing on three discrete elements of this model, primarily around the mediating variables of internal service, e-procurement compliance, and supply relationships. We are also undertaking work within the private sector in order to assess the extent to which findings from this study are paralleled in a different context. Finally, we are looking to a large scale survey to evaluate the impact of e-procurement. Such studies conducted around a common model allow for comparative analyses.

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