Literature review: the treatment of electronic procurement in core is journals and conference papers

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LITERATURE REVIEW: THE TREATMENT OF ELECTRONIC PROCUREMENT IN CORE IS JOURNALS AND CONFERENCE PAPERS

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Abstract

Procurement forms a vital part of any business' operation and accrues more than 50% of most companies' costs (Van Weele 2005). Electronic procurement (e-procurement) plays an increasingly important role when enterprises obtain equipment, materials or supplies. In order to describe research on e-procurement in core IS outlets, a literature review of the "Basket of Eight" (AIS 2019), plus two key IS conference papers, has been performed. The review reveals that out of 71 papers containing "procurement" in abstracts, 49 are considered to belong to at least one of three categories defining IS research. The review examines how these 49 papers contribute and complement each other using Benbasat and Zmud (2003) as a framework in order to ascertain how core IS research has covered e-procurement, providing a reference point to other IS researchers studying electronic procurement.

Keywords: Core IS Research, e-Procurement, IT artifact

1. Introduction

Electronic procurement (e-procurement) systems, including procurement modules in ERP packages, comprise a group of IT artifacts that deserves attention. Over 50% of the costs of most companies are incurred by procurement (Van Weele 2005). Procurement has been an important but neglected issue within the social science of technology (Pollock and Williams 2007), while also being increasingly recognized as strategic and the subject of performance management (Batenburg and Versendaal 2008). E-procurement is an indispensable tool for automating procurement in physically distributed enterprise environments (Gunasekaran, McGaughey et al. 2009). These are good reasons for the Information Systems (IS) research community to intensify research on e-procurement. Researchers have a need to see their work as part of a research discipline, so they themselves belong to a preferred research community. This literature review contributes to such an effort by lining up knowledge that core IS research outlets have produced on e-procurement.

Electronic procurement is relevant to a number of research disciplines. The boundaries of what belongs to the realm of Information Systems (IS) have been the subject of some debate. Receiving more than 1700 citations, Benbasat and Zmud (2003) have drawn up a set of core characteristics that have been widely accepted. At the core of IS research is the study of (1) the construction and implementation of IT artifacts, (2) how they are used, supported, and have evolved, and (3) how they impact and are impacted by the contexts in which they are embedded (Benbasat and Zmud 2003). Being aware of the important role that electronic procurement plays in modern businesses, a review of how scholars in core IS journals – "the Basket of Eight" (AIS 2019), plus the proceedings of two core IS conferences: the International Conference of Information Systems (ICIS) and the European Conference of Information Systems (ECIS) – can reveal the aspects of e-procurement that IS research has focused on up until now, as well as the areas that have attracted little attention within the IS research community. In this paper I review and synthesize research on how electronic procurement artifacts are acquired, utilized, and impacted with the purpose of providing guidance for future research in this area.

The rest of the paper is organized as follows: The second chapter provides a closer look at what characterizes core IS research and introduces a suggested categorization and basic framework based on Benbasat and Zmud (2003). The third chapter reviews the selected papers according to thematic focus.

Chapter four discusses the findings, Chapter five highlights limitations, while Chapter six concludes the paper.

2. E-procurement in IS research

In an attempt to define the core properties and identity of Information Systems (IS) research, Benbasat and Zmud (2003) suggest that IS research should be concentrated around the information technology (IT) artifact. Although their attempt at narrowing the boundaries of IS research has been met with considerable debate (see e.g. Robey 2003, Agarwal and Lucas Jr 2005), the impact of their seminal article impact on the IS research field has been remarkable. Conceptualizing the IT artifact as "the application of IT to enable or support some task(s) embedded within a structure(s) that itself is embedded within a context(s)", they list three generic subjects that form part of the core of IS research: (1) construction and implementation of IT artifacts, (2) how they are used, supported, and have evolved, and (3) how they impact and are impacted by the contexts in which they are embedded (Benbasat and Zmud 2003).

2.1. Framework

We view the first category as the *Acquisition* aspect of e-procurement IS research. The next category, concerning how electronic procurement systems or infrastructures evolve, are supported and used, we call the *Utilization* aspect. The third category, concerning the impact on contexts and vice versa, we call the *Impact* aspect. Figure 1 below illustrates this basic framework.

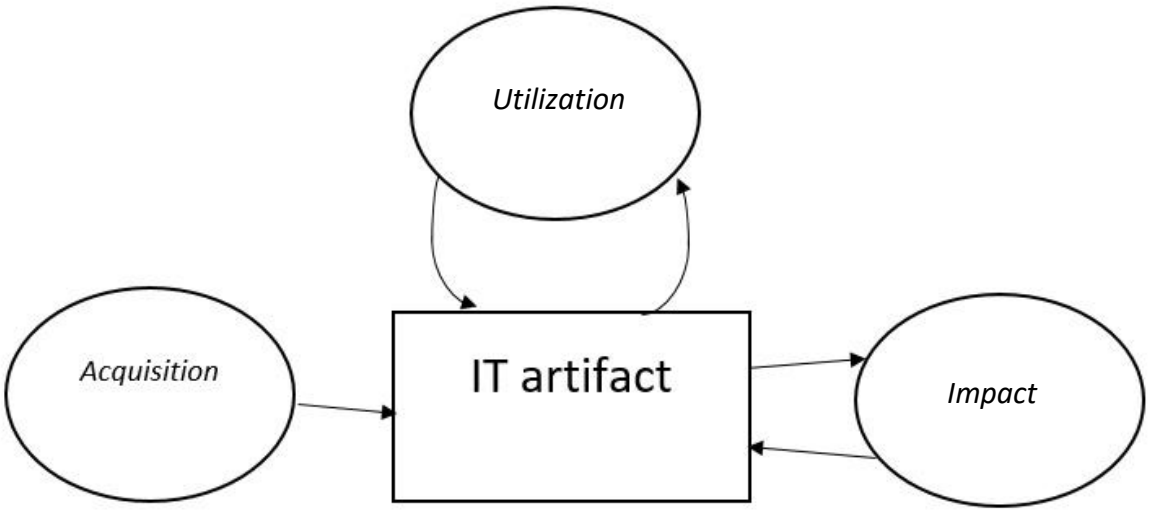

Figure 1. Core aspects of the IS study of IT artifacts

The artifacts that comprise the domain of e-procurement are a heterogeneous group. Enterprise Resource Planning (ERP) systems or Enterprise Systems (ES) are central in most business-to-business (B2B) purchasing as they serve as the transactional backbone of most businesses. Nowadays, they mainly come as packaged software more or less made ready for customization. Customer Relationship Management (CRM) systems and Supplier Relationship Management (SRM) systems are often hooked onto ERPs. Procurement can take place through electronic marketplaces run by intermediaries, or the marketplace may belong to either the buying or the selling organization. The rules of the marketplace are set by its owner, and functions organizing bidding and (reverse) auctions influence how power is distributed and strategies developed by the parties. In a B2B environment, procurement involves communication through electronic channels such as telephone, email, web-cast, and video conferences. These artifacts also belong to the e-procurement domain, because all the described tools work in concert to make procurement happen as they form an electronic procurement infrastructure.

The acquisition of e-procurement artifacts involves buying software (and hardware) packages or designing and programming custom applications to serve special needs. Another way of implementing new e-procurement solutions is to outsource the function to a third party, for instance, to hook up to an electronic marketplace in which tenders and bids are placed. The ways that procurement systems and processes are adopted fall in under the study of acquisition. The acquisition aspect influences customer-supplier relationships as well as internal organizational circumstances.

The utilization aspect covers how e-procurement artifacts are treated by users; how users, for example, buyers, have to adopt new procedures and utilize system features in order to improve performance and oversee transactions. As time passes, there are new opportunities and new system functions included. Work practice and system features mutually evolve, supported by organizational and technological expertise.

Basically, e-procurement system contexts are inter- or intra-organizational. Buyer-supplier relationships are impacted by the features of electronic procurement artifacts. At the same time, the systems adapt to requirements set by organizational needs and the way in which business partnerships develop.

2.2. Method and matrix

Table 1 lists the papers from the core IS research outlets, indicating which aspects are covered according to an inspection of abstracts. The extract and abstract inspection was performed in March 2019. Using scientific search engine Scopus, identifying the journals by ISSN, and specifying "*procurement*" as search parameter in ABSTRACT, 71 papers were identified. The identified papers' abstracts were inspected, and 49 papers were considered to adhere to the Benbasat & Zmud criteria, 22 were interpreted as directly belonging to acquisition, 13 to utilization, and 15 to impact aspects. As denoted by "(X)" in the table, several papers were interpreted as studying additional categories.

Citation	Acquisition	Utilization	Impact
(Goren 1984)	X		
(Saarinen and Vepsäläinen 1994)	X		
(Kettinger and Hackbarth 1997)	X	(X)	
(Scown 1998)	X		
(Kar Yan Tam 2001)	X		
(Ash and Burn 2003)		(X)	X
(Holland, Shaw et al. 2005)		X	
(Kauffman and Mohtadi 2004)	X		
(Pan, Pan et al. 2004)	X		
(Howard 2005)		(X)	X
(Dai, Narasimhan et al. 2005)		X	
(Fairchild, Finnegan et al. 2005)	X	(X)	
(Howcroft and Light 2006)	X		
(Zhong and Wu 2006)		(X)	X
(Nagle, Finnegan et al. 2006)			X
(des Reis and Soares 2006)	X		
(Hackney, Jones et al. 2007)	(X)	X	(X)
(Mishra, Konana et al. 2007)		X	(X)
(Gogan and Gelinas Jr 2007)	X		
(Williams and Hardy 2007)	(X)	X	(X)
(Neumann, Block et al. 2007)	X		
(Chang, Wang et al. 2008)			X
(Dedrick, Xu et al. 2008)			X
(Adomavicius, Gupta et al. 2008)			X
(Batenburg and Versendaal 2008)	(X)	(X)	X
(Mola, Rossignoli et al. 2008)			X
(Boumediene and Kawalek 2008)	X		
(Kauffman and Tsai 2009)		X	(X)
(Rai, Brown et al. 2009)	X		(X)
(Xia and Xia 2008)		(X)	X

(Yu, Mishra et al. 2009)	X	(X)	
(Raventos and Zolezzi 2009)			X
(Sankaranarayanan and Sundararajan 2010)			X
(Mishra and Agarwal 2010)		X	
(Seo and Warman 2011)		X	(X)
(Koppenhagen, Katz et al. 2011)		X	(X)
(Bensch and Schrödl 2011)	X		
(Kannan 2012)		(X)	X
(Adomavicius, Gupta et al. 2012)		X	(X)
(Schrödl 2012)	X		
(Shaikh and Cornford 2012)	X		
(Sanchez-Rodriguez, Martinez-Lorente et al. 2012)	X		
(Petrakis, Ziegler et al. 2012)		X	(X)
(Bichler, Shabalin et al. 2013)	X	(X)	(X)
(Adomavicius, Curley et al. 2013)		X	X
(Mitra 2014)		X	
(Harnisch and Knaf 2014)	X		
(Dauer, Karaenke et al. 2015)	X	(X)	
(Sambhara, Keil et al. 2011)		(X)	X

Table 1. Aspects studied in core IS papers on e-procurement

3. Review

3.1. Acquisition

In this section we take a closer look at how IS researchers in core journals and conferences have studied the construction and implementation of electronic procurement artifacts. In the 1990s, custom-made business and manufacturing information systems were gradually replaced by ERP packages offering support for procurement processes such as sourcing and purchasing.

Neumann, Block et al. (2007) point out that there is no single best solution for all sourcing activities. Instead, they propose an algorithm-based system to guide the design of procurement mechanisms. The need to model the design of electronic procurement processes is also addressed by Bensch and Schrödl (2011) who tie this up to the Supply-Chain Operations Reference (SCOR) model. Schrödl (2012) explores the modeling of electronic procurement processes for cloud-based product-service systems.

Electronic Reverse Auctions (ERAs) have attracted considerable attention from IS researchers. Several specialized algorithms have been proposed as extensions or supplements to the well-known lowest-bid-wins electronically organized auction software (Fairchild, Finnegan et al. 2005, Bichler, Shabalin et al. 2013, Dauer, Karaenke et al. 2015).

Relatively early works are concerned with the selection of computer vendors and procurement strategies (Goren 1984, Saarinen and Vepsäläinen 1994, Kar Yan Tam 2001). The procurers' knowledge and choice criteria are of particular interest (Scown 1998, Kar Yan Tam 2001).

When it comes to acquisition and implementation of e-procurement in organizations, motivation and adoption have been the focus of many IS research projects. The economic rationale for e-procurement investments are the theme when B2B e-procurement system investments are modelled by Kauffman and Mohtadi (2004), as well as the perceived benefits and organizational readiness of small firm suppliers (Kettinger and Hackbarth 1997). Gains in productivity and performance are explored in two other studies (Rai, Brown et al. 2009, Sanchez-Rodriguez, Martinez-Lorente et al. 2012). Harnisch and Knaf (2014) highlight the importance of how license (tariff) models determine total life cycle costs. Understanding the role that total cost of ownership plays in government software procurement decisions was the aim of Shaikh and Cornford (2012). In their case, finding it was used as an argument to gain acceptance for open source adoption. In another governmental context, Gogan and Gelinas Jr (2007) describe a pilot project to establish the feasibility of adopting an application service provider solution for procurement by multiple US federal agencies. Power issues within organizations combined with technological knowledge and capabilities are also highlighted as determinants for the adoption of e-procurement (des Reis and Soares 2006, Howcroft

and Light 2006, Boumediene and Kawalek 2008, Yu, Mishra et al. 2009), while Pan, Pan et al. (2004) examined how a UK governmental e-procurement project was kept under time and budget control by psychological means for de-escalation of commitment.

3.2. Utilization

The second group of key IS research aspects that Benbasat and Zmud (2003) list concerns how IT artifacts are used, treated, and how they evolve. In this section we examine this in an e-procurement context.

Internet use in the procurement process has antecedents and consequences and Mishra, Konana et al. (2007) models this using survey data from 412 firms, while Holland, Shaw et al. (2005) describe how a global company used the Internet in its marketing strategy and created a smart business network. The use of electronic markets as innovations have been studied and modelled by Mishra and Agarwal (2010) based on data from 292 firms.

The way in which IT artifacts are supported is closely related to reliability and user satisfaction. Seo and Warman (2011) explored how user satisfaction related to service convenience and performance failure of a governmental e-procurement system in Indonesia.

The use of electronic reverse auctions has attracted much attention from IS researchers. The ways in which ERAs are organized and performed varies and Dai, Narasimhan et al. (2005) use ERAs conducted by application service providers to exemplify centralized e-sourcing computing. Hackney, Jones et al. (2007) find by studying a governmental ERA application in the UK adequate process preparations to be critical in reverse auction procurements. Complex auctions (multiattribute, combinatorial) are suggested promising economical gains in time and money (Adomavicius, Gupta et al. 2012, Petrakis, Ziegler et al. 2012, Adomavicius, Curley et al. 2013).

Kauffman and Tsai (2009) explore how ERP systems and procurement practices evolve during the adoption of unified procurement, the “move-to-the-middle” (Clemons, Reddi et al. 1993) trend. Williams and Hardy (2007) found that e-procurement has transitioned a largely operational concern to a more strategic position in organizations. Suggesting design principles for improving procurement network performance, Koppenhagen, Katz et al. (2011) argues that the present e-procurement system provides weak support for people who network across company borderlines. Following an ERA systems integrator, Mitra (2014) addresses the evolvement of the electronic auction artifact and the strategic plan to grow the business.

3.3. Impact

The ERA concept appears being rigged for to make savings on the customer side on the cost of suppliers. Its impact on the customer-supplier relationships has deserved – and received – some attention from the IS research community. While Zhong and Wu (2006) find it may not necessarily harm – and may even possibly enhance – long-term buyer-supplier relationships, Adomavicius, Gupta et al. (2008) highlight the importance of what information about the buyer’s preferences that is disclosed to the suppliers in the auctions. Information feedback schemes, information asymmetry, buyer and supplier opportunism, a bidder’s incentive to learn about his/her competitors, are related problems that are addressed in several works (Sambhara, Keil et al. 2011, Kannan 2012, Adomavicius, Curley et al. 2013).

The impact of e-procurement such as increased economic benefits for customers (and sometimes also for suppliers) is described. Procurement performance is positively related to procurement maturity (Batenburg and Versendaal 2008). Howard (2005) reports on findings from 28 firms that adopted e-procurement in order to gain a competitive advantage in their supply chains. E-business architecture in ERP-enabled organizations (Ash and Burn 2003) and e-markets (Xia and Xia 2008, Raventos and Zolezzi 2009) provided lower procurement prices and increased supply chain efficiency. Lack of fit between the business environment and electronic procurement technologies has produced additional burdens and costs in some (Chinese) buyer-supplier relationships (Chang, Wang et al. 2008). Dedrick, Xu et al. (2008) find that the impact of e-procurement on the number of suppliers resulted in fewer suppliers for standard/commodity goods but more for custom goods.

E-marketplaces are reported to have had a surprising impact on some business environments. Mola, Rossignoli et al. (2008) observed market participants privileging the e-marketplace as an exclusive club of

well-connected businesses rather than something that was open to the entire market, while Sankaranarayanan and Sundararajan (2010) observes an increase in outsourcing.

Reverse impacts were explored by Nagle, Finnegan et al. (2006). Classifying business relationships as being adversarial and collaborative, the various effects they have on e-procurement systems and processes were examined.

4. Discussion

The most striking observation is the high proportion of papers on ERAs. Being potentially the most controversial IT artifacts regarding procurement, ERAs invite researchers to propose new algorithms, extensions and strategies. The primary assumption that ERAs are perceived as having a negative impact by suppliers has, to some extent, been modified in several papers. Yet the impact of all the new ways of designing and operating ERAs paves the way for significantly more IS research.

Other works on the construction and implementation of e-procurement artifacts are concentrated on selection strategies, process models and adoption. Aspects of the economic rationale for the acquisitions and control of the process of introducing new e-procurement artifacts are key themes in these studies.

Studies that examined how procurement IT artifacts are used, treated, and evolve, were initially focused on Internet use and electronic markets. Besides the focus on the opportunities opened by ERAs, the manner in which procurement practices and e-procurement artifacts have evolved under particular circumstances has been studied in several papers, although these artifacts are relatively new and will probably evolve further in the years to come, inviting further IS research.

Research on the impact of e-procurement on organizations is largely limited to the economic benefits and costs, with the exception of ERAs, where buyer-supplier relationships have received particular focus. In this review, the impact of the environment on e-procurement systems has only been identified in one paper. Further IS research on the impact of e-procurement on buyer-supplier relationships, and vice versa, should be highly welcomed.

5. Limitations

There are limitations to this paper. First, the sample is based on eight core IS journals plus the proceedings of two key IS conferences. Interesting studies will be published in other outlets that supplement the understandings brought forward here. Second, the search criteria could be incomplete because some papers that discuss e-procurement may not contain the term “procurement” in their abstracts. Terms as “sourcing”, “buying”, and “purchasing” could possibly have expanded the number of prospective papers, but addressing e-procurement without mentioning “procurement” in the abstract would be to avoid the key term.

6. Conclusion

6.1 Research contributions

As procurement makes up a large part of business life and e-procurement has become an integral part of B2B relationships, the IS research community should pay considerable attention to e-procurement IT artifacts. Sharing the concerns for IS research, as propagated by Benbasat and Zmud (2003), this literature review will offer help to researchers entering this scientific realm.

A particular contribution is the observation of the very limited number of works on e-procurement’s impact on buyer-supplier relationships when we exclude the ERA studies. The observation should encourage IS researchers to fill this gap.

6.2 Managerial implications

While there is no single best solution for all acquisition activities, the research points towards the SCOR model and algorithm-based design of procurement mechanisms as alternative approaches. Adoption and motivation are highly dependent on technological knowledge and capabilities in the organization, and gains and benefits of e-procurement investments can't be taken for granted in all settings.

Organizations that plan to utilize new e-procurement technology should pay attention to how the IT artifacts are supported, as failure in reliability and service convenience cause user dissatisfaction and performance failure. The ways ERAs are prepared and organized are critical for success, and complex auctions prospect economical gains. The role of ERP systems has evolved towards a more strategic position in the organizations, but meet challenges in supporting networking across company borderlines.

The studies of impacts e-procurement have made on business environments, have focused on increased economic benefits (especially for customers), the impact on the number of suppliers, and how ERAs influence buyer and supplier opportunism as business relationships are classified as being adversarial and collaborative.

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