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Research on Public Procurement of Information Systems: The Need for a Process Approach

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Abstract:

In this paper, I take stock of the current state of research on public procurement of information systems (IS). Based on a review of the extant literature, I identify several research gaps. A key finding is that little attention has been paid to the process of public procurement, and most of the papers focusing on the process are limited to one specific task, such as tendering and vendor selection. A substantial proportion of these studies are variance or snapshot types. I emphasize the need for more longitudinal research that covers the whole process, and suggest a research approach that focuses on issues such as stakeholder involvement and management, and the application of dialectics.

Keywords: Public Procurement, Procurement Of Information Systems, Acquisition, Purchasing, Buying Behavior, Process Approach.

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I. INTRODUCTION

Because few firms and public entities continue to develop their own software, procurement has become the most common way of acquiring information systems (IS). However, procuring these systems is a highly complex process. Information systems encompasses very different types of systems that range from packaged off-the-shelf general office software to specialized systems for niche sectors, such as public social services. Significant challenges arise in procuring the larger and more specialized systems, such as those challenges in specifying requirements before announcing tenders and comparing competing systems. These arise because procuring entities buy items they have not bought before, or at least not in the last 4-5 years. The process carries the risk that procuring entities could specify the wrong features and functionality, and that they could miss new functionality that they may not be aware of. New information systems will influence the work processes and the job content of their users; hence, their input is vital for specifying requirements and selecting the right system. Research on IS procurement could contribute to our knowledge by providing insight on the process of requirement specification, and on users' involvement and management of different stakeholder interests in the procurement process.

The findings of an early review (Thai, 2001) show that public procurement has been a neglected area of study. However, Thai does not refer to any systematic search method or to any selection criteria, and much has happened in the procurement field since the year 2000. Thus, the time has come to take stock of the research on public procurement and to focus specifically on the procurement of IS. Based on a new and more systematic review of the literature, I summarize the previous findings and identify several research gaps. The most important gap is a lack of process approach. I also emphasize that a process approach is crucial for understanding the challenges in public procurement. Others have previously stressed that a process perspective is necessary for understanding and explaining IS development and technological change (Hekkert, Suurs, Negro, Kuhlmann, & Smits, 2007; Lyytinen & Newman, 2008; McLeod & Doolin, 2012).

I further suggest a research agenda that focuses on stakeholder issues, stakeholder management, and dialectics—a set of theories that may contribute to both academia and practice in public IS procurement. The rest of the paper is organized as follows. In Section 2, I define the concept of procurement and its increasing strategic role. In Section 3, I cover the research process and the methodology. In Section 4, I present the review of current research on public procurement of IS, and, in Section 5, I summarize the findings from prior research and suggest a research agenda with associated research questions.

II. THE CONCEPT OF PUBLIC PROCUREMENT

Public procurement is “the acquisition (through buying or purchasing) of goods and services by government or public organizations” (Hommen & Rolfstam, 2009). Some view public procurement as a more extensive process that encompasses purchasing and spans the whole lifecycle from identifying the needs and acquiring goods and services to ending a services contract or disposing an asset (Murray, 2009). In my understanding, public procurement includes formulating business requirements, developing requirements specification, and purchasing, which possibly includes tendering and contract signing, receiving and inspecting the product, and dealing with organizational issues such as stakeholder involvement. This process is subject to both legal requirements and specific policy goals.

Procurement became a more integral part of the public value chain in the 1990s (Lyne, 1996). Around that time, firms started focusing more on their core competencies and outsourcing various activities to their business partners, which led to procurement becoming more strategically important (Rosemann, 2003). A general framework of different procurement strategies for IS was developed (Saarinen & Vepsäläinen, 1994), although the authors who developed the framework found little empirical support for it. The Federal Acquisition Institute of the U.S. Government raised the issue of improving professionalism among procurement personnel (Matthews, 2005) because governments need to operate with efficiency and accountability.

We can categorize procurement into two broad forms: “partnership sourcing” and “adversarial competition” (Parker & Hartley, 1997). Partnership sourcing implies outsourcing work (e.g., systems development on a more or less regular basis to the same vendor). Adversarial competition refers to the rivalry between two or more vendors for a new contract. Private firms may select one or more vendors based on prior relations, or even apply partnership sourcing. This option is not available in the public sector. Due to procurement regulations, tendering is normally required, and this is generally done in the form of an open and transparent process, as in adversarial competition.

In the European Union (EU), two public procurement directives with strong implications are in effect (Costantino, Dotolli, Falagario, & Sciancalepore, 2012). Underlying the E.U. regulations are the principles of transparency and non-discriminatory competition (Cox, 1994). All public procurements above a threshold value should be announced in advance and all vendors should be given the same opportunity. If a procurement contract is expected to be above the E.U. threshold level, a call for tender has to be announced in the E.U. electronic database for tenders (TED). The threshold level has been set at €200,000 for 2013. Some countries have additional national threshold levels (e.g., Norway at NOK500,000, Denmark at DKK500,000), beyond which a call has to be announced in the national database. Even if a public procurement is below this lower level, a procuring entity is obliged to compare prices from different vendors and choose the best offer. In the United States (US), public entities have to comply with the Federal Acquisition Regulation (FAR).

The legal regulations lead to a more complex procurement process in the public sector; however, there are strong motivations for this added complexity. Regulations can prevent corruption in public procurement (Csáki & Gelleri, 2005) by prescribing formal decision processes. Because public procurement involves spending taxpayers' money, doing so efficiently and getting the best possible value for money is a major concern. Public procurements constitute a significant share of the private market for goods and services; hence, business people emphasize the need to provide equal opportunities for competitors. Politicians and citizens are also concerned about the role that public procurement can play in stimulating communities and serving policy goals. Policy making and management influences the procurement process, and policy goals can be in conflict. One conflict is between stimulating the business community in a region and ensuring equal opportunities for all businesses irrespective of where they are located.

The procuring entity also deals with the challenge of satisfying the needs of different stakeholders, which may be in conflict. Information systems normally influence the work processes of many users, who could also have conflicting requirements. This challenge may be tougher in the public sector than in the private sector. Moreover, organizations that are subject to political rather than economic controls are likely to face multiple sources of authority that are potentially conflicting (Boyne, 2002). A good example is the "NHS National Programme for IT in the UK" (BBC, 2009; BCS, 2008; Johnson, 2011), which has experienced a huge overrun in time and costs. This was a highly political project, with many conflicting interests involved. It had a centralized national approach, but with different suppliers involved in an effort to increase competition.

A public entity may face several dilemmas in a procurement process. One such dilemma is the conflict between following the rules and regulations and preferences for a specific software vendor. Another dilemma could be between following the formal rules and regulations and communicating with the different vendors, or further developing the requirements after a tender has been announced in order to procure the best system. In addition, there is the obvious dilemma between price and functionality. All of these dilemmas are further complicated when different stakeholders have different and even conflicting interests. Stakeholders that are involved in the process may have quite different views on what functionality is needed, or they, based on prior experiences, may differ in their viewpoints on specific vendors.

The added issue of different stakeholder interests makes public procurement even more complex. There are also challenges in procuring information systems because quality may be more important than price, and quality is hard to compare when requirements are uncertain. Due to these inherent challenges and due to the added complexity of procurement in the public sector, there is a need for research on the public procurement of IS. In Section 3, I overview how I carried out the research process for this paper, and present the main findings.

III. RESEARCH PROCESS

I conducted a systematic literature review using previously proposed guidelines (Kitchenham, 2004; Kitchenham et al., 2009; Okoli & Schabram, 2010) and adopting the process for literature reviews described by Webster and Watson (2002). I focus on the "procurement of information systems in the public sector", and the unit of analysis is public organizational entities. Few articles have been published specifically on the area of "government procurement of IS" or "public procurement of IS". Hence, my literature search included public and government procurement in general. Some specific challenges in public IS procurement may not be covered by this research, so I also searched for general work on IS procurement. My interest lies in the intersection of public procurement and IS procurement (the shaded area in Figure 1).

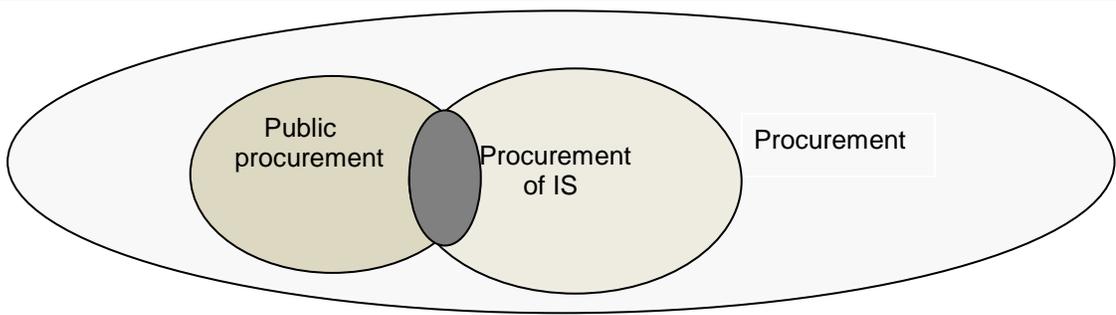


Figure 1. Focus of the Literature Review: Intersection of Public Procurement and IS Procurement

I conducted my search by browsing both library search engines and Google Scholar using a set of keywords¹. I conducted a systematic search through selected journals in e-government (e.g., *Government Information Quarterly*) and in IS (e.g., *MIS Quarterly*) in issues published from 1992 onwards. After excluding papers based on their quality criteria and relevance, and after carefully reading the abstracts, a total of 138 references remained. I found that the field of procurement and public procurement of IS has been neglected in the IS literature. The majority of journal articles in my data are from non-IS journals, which further underlines the lack of research from the IS community. Of the selected journal papers, only 15 were published in IS journals, and a further seven were published in journals on computer science or computer engineering.

I have used Thai's (2001) "systems view of public procurement" (Figure 2) to organize my findings. The conceptual model was introduced in this paper (Thai, 2001), which has been frequently cited, and it consists of four interrelated boxes. The box entitled "procurement function in operations" represents management and personnel, the organizational structure, and the procurement process, including tools, techniques, and methods.

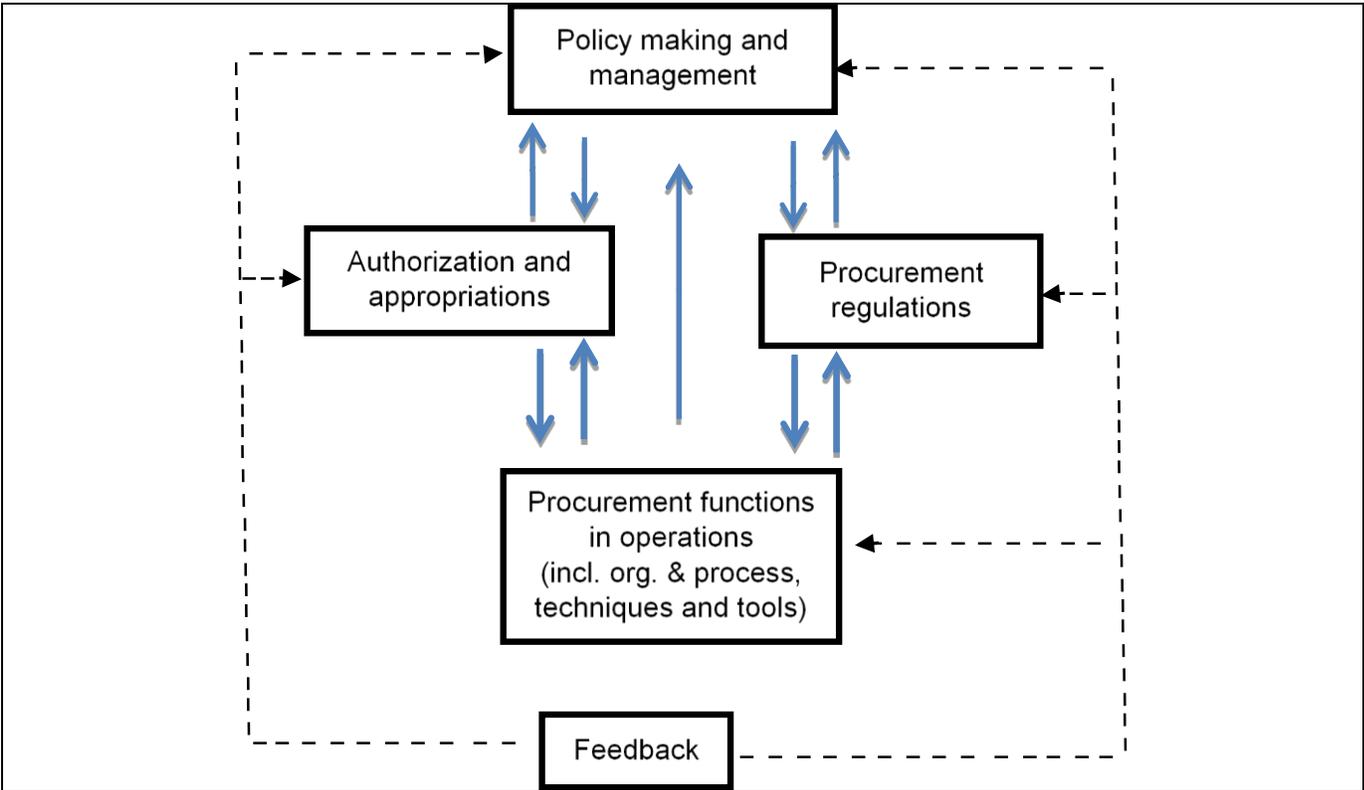


Figure 2. Systems View of Public Procurement (Thai, 2001)

Table 1 summarizes my findings in four main categories. The three first categories are based on Thai's (2001) conceptual model, and the fourth consists of papers that were more general of nature. I categorized my findings in

¹ Details of the full literature review is provided elsewhere, and can be provided by contacting the author.

this way based on carefully reading all of the abstracts. Papers covering the private sector were included in this overview when they cover IS procurement, or when they serve the purpose of covering the actual process.

Table 1: Development of Publication Numbers for Different Topic Areas

| | | < 2000 | 2000-2012 | Total |
|-------------------------------------|---|--------|-----------|------------|
| Policy making and management | | 4 | 25 | 29 (21%) |
| Procurement regulations | | 10 | 4 | 14 (10%) |
| Procurement functions in operations | <i>Technology for procurement (e-procurement)</i> | 1 | 26 | 27 |
| | <i>Organizing procurement</i> | 6 | 19* | 25* |
| | <i>The procurement process</i> | 0 | 24* | 24* |
| | <i>Sum, papers on procurement functions in operations</i> | 7 | 62 | 69 (50%) |
| General | | 6 | 20 | 26 (19%) |
| Number of papers across topic areas | | 27 | 111 | 138 (100%) |

* I classify 12 papers in the organizing procurement, 17 papers in the procurement process subcategory in the 2000-2012 period, and seven papers in both subcategories.

As Table 1 shows, the number of publications grew for all topic areas except for procurement regulations. This topic became an important research area when the EU introduced new procurement regulations between 1988 and 1992. Prior practices had led to inefficient and high-cost industries being sustained and to inefficient markets (McGowan, 1991). Martin, Hartley, and Cox (1999) expect that substantial public expenditure savings could be gained by overcoming the protectionist sentiment. In my search, I identified only four papers on procurement regulations published after the turn of the century.

There is a huge increase in publications on the “big box” in Thai’s (2001) conceptual model called “procurement functions in operations”. However, this box includes managers and procurement personnel, organizational structure, techniques and tools for procurement, and the actual process. It was also described as “the most important and most complicated element of the public procurement system” (Thai, 2001); hence, further examination is needed. By breaking down the procurement in the function box into separate issues, we find that there are only 24 publications covering the actual process. Thai’s model places relatively little importance on this issue, which is rather surprising given the complexity of, and the inherent challenges faced in, public procurement. A further examination of the procurement process can highlight what we already know and what questions remain unaddressed.

IV. THE PROCUREMENT PROCESS

In-depth and longitudinal analysis of software procurement has been scarce (Heiskanen, Newman, & Similä, 2000) and, although the number of publications on public procurement has increased considerably, this scarcity still remains. To date, limited work has focused specifically on the process of IS procurement, and surprisingly few systematic studies cover software package procurement (Pollock & Williams, 2007). However, there are a few papers dealing with specific phases and tasks in the process. I will present my findings on the different phases in the process before I look at the procurement process as a whole.

Figure 3 overviews the tasks involved in public procurement under the E.U. directives, without including issues such as who is involved and how the different tasks are carried out. I use this simplified overview to organize the findings of my literature review.



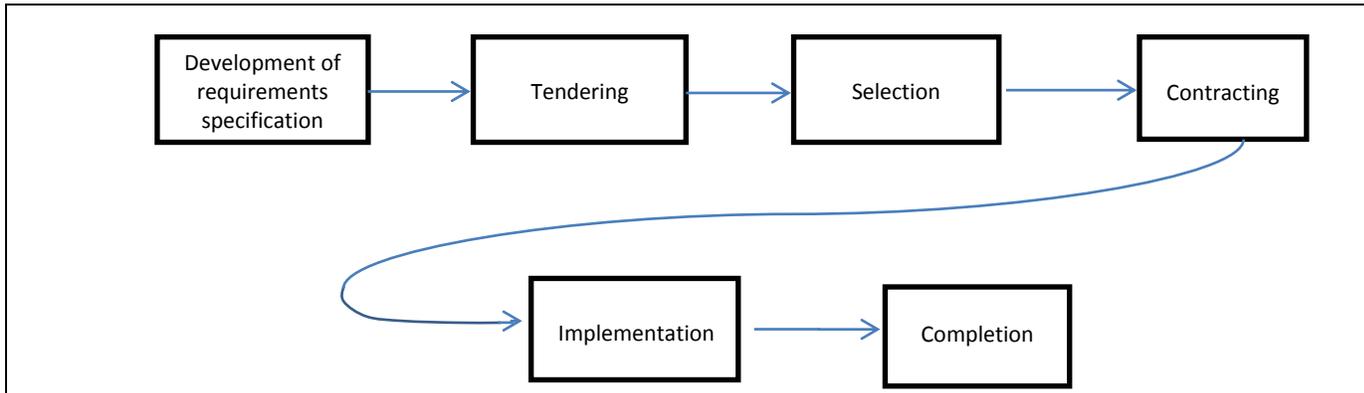


Figure 3. Overview of the Public Procurement Process

When a public entity runs a procurement process, it first has to decide what to procure and how to select the best offer. This step is usually performed in a requirement specification. Based on this, the entity announces a call for tender. The tender is an invitation for businesses to prepare bids and submit them in a certain deadline. For procuring IS, negotiations may be carried out as part of the vendor selection. The negotiations may concern issues such as price, training, implementation schedule, and what add-ons to include. These negotiations may also make it easier to decide whether an offer covers all of the requirements. The winner may be selected on the sole basis of price, or on a combination of price and quality.

When a winner is selected, a contract is signed. The procuring entity notifies all competing vendors, and gives them a period in which to file a complaint if they believe the process has not been in line with the regulations. After this deadline, the contract becomes effective and implementation can start. This phase may include tasks such as making adaptations to the system, tuning the parameters, converting data from the old system, and training the users and support staff. It leads up to the completion phase and final acceptance of the system.

My findings cover research on the development of requests for proposal, tendering, vendor selection (including negotiations), contracting, implementation, and completion. I identified only one paper specifically on requirements specification in procurement, and no papers on implementation or completion of procurement (see Table 2). The distinction between tendering and selection may seem arbitrary because some papers may focus on one of these phases, but have findings that relate also to the other.

The papers referred to in Table 2 differ as to whether they explicitly focus on one phase or cover larger parts of the process. They also differ regarding what research approach they applied, on whether they are purely conceptual or include data collection, and on the context and type of procurement. Of the papers referenced, seven are on public IS procurement (but Table 2 also includes eight papers on IS procurement in the private sector, and nine papers on general public sector procurement due to their relevance for the process issue). Table 2 clearly shows that the focus has been mostly limited to the tendering and selection phases, and indicates that the initial work in forming the project team and specifying requirements, and the subsequent work involved up to completion of the procurement has been largely ignored in prior research.



Table 2: Distribution of Papers Focusing on Specific Phases in the Process of Procurement

| Focus areas | No. | |
|-------------------------------------|-----------------|--|
| Requirements specification | 3 | Johannessen, Obstfelder, and Lotherington (2012), Johansson and Lahtinen (2012), Moe, Risband, and Sein (2006) |
| Tendering | 6 | Hensher & Stanley (2008)*, Johannessen et al. (2012), Johansson and Lahtinen (2012), Karjalainen and Kempainen (2008)*, Lawther and Martin (2005), Mateus, Ferreira, and Carreira (2010)* |
| Selection (including negotiations) | 11 | Bartle and Korosec (2003)*, Falagario, Sciancalepore, Costantino, and Pietroforte (2011)*, Heiskanen et al. (2000), Hensher and Stanley (2008)*, Howcroft and Light (2002)**, Lian and Laing (2004)*, Lorentziadis (2010)*, McCrudden (2004)*, Moe et al. (2006), Pollock and Williams (2007), Rapscsák, Sági, Tóth, and Kétszeri (2000) |
| Contracting | 2 | Banerjee and Duflo (2000) **, Tadelis (2012)* |
| Implementation | 0 | |
| Completion | 0 | |
| The whole process of IS procurement | 6 | Assman and Punter (2004), Dawson, Watson, and Boudreau (2011), Howcroft and Light (2006)**, Poon and Yu (2010)**, Schiessl and Duda (2007)**, Verville and Halington (2003)** |
| Total number of papers | 24 ² | |

Note: * Papers on general public procurement; ** Papers on private sector procurement of IS.

Findings on the different phases

I present the findings on different phases in more detail in the following sections. Two papers that are not in the review are also discussed (Juristo, Moren, & Silva, 2002; Moe & Päivärinta, 2013) due to their specific relevance.

Requirements Specification

Specifying the requirements is the first formal phase of a procurement project; however, the process itself starts earlier with a growing awareness of the need for a new system. The need can arise for different reasons: the old system may need updating with new functionality or to be integrated with other systems, the vendor of the old system may not support it anymore, or the procuring entity may not have a system at all. The reason for the procurement may affect the complexity of the requirement specification. Vendors may also actually take part in the requirement specification. A case study of the procurement of a laboratory system in a Norwegian hospital (Johannessen et al., 2012) shows how one of the vendors was involved in an innovation project, which later was used as a basis for the requirements specification.

Findings from a Swedish study focusing on requirements specification in IS procurement (Johansson & Lahtinen, 2012) reveals challenges with fuzzy requirements in tender announcements. In particular, there are specific challenges with fuzzy non-functional requirements (such as usability), while hardware requirements are found to be “restrictive”. These issues imply the need for more research on this specific phase.

Two case studies in a Norwegian municipality indicate tensions or dilemmas between creating requirements specifications up front or developing the system specification as an integral part of the procurement process (Moe et al., 2006). The latter option would allow for greater learning from the vendors. Another issue that may influence the requirements specification is what Thai (2001) referred to as “policy making and management” (see Figure 3). We may expect tensions or dilemmas between the goal of open and fair competition and applying procurement as an instrument for achieving specific policy goals. Both of these dilemmas require more research.

A Delphi study on the challenges in public IS procurement (Moe & Päivärinta, 2013) may also support the need for more research on requirement engineering, even though the study does not focus on this phase per se. This study shows that chief information officers (CIOs), procurement managers, and vendors experience significant challenges in the requirements specification. While procurement managers and CIOs focus on getting a clear and complete picture of requirements with the necessary details, vendors find requirement specifications too detailed and extensive (Moe & Päivärinta, 2013). Hence, further research is needed on the reasons for this difference in focus, what problems it may lead to, and how to overcome these conflicting concerns.

² The sum of the different focus areas is higher (27) than the total number of papers covering the process (24) because some of the papers cover two phases and are included twice.

Low user involvement has been reported as a problem in requirements engineering in systems development (Juristo et al., 2002), and this finding may also apply to requirement specification in public procurement of IS. To date, this issue has not been covered in research on IS procurement. Thus, research is also needed to understand how to involve important stakeholders efficiently in this phase.

Tendering

The Public Procurements Directive (2004/18/EC Directive) for the EU and the EEA requires public entities to publicly announce their call for tenders for all procurements above a threshold value through the tender electronic database (TED). Similar regulations exist in the US and several other countries. The EU specifies different procedures, such as open tender, restricted tender, negotiated procedure, and competitive dialogue, with minimum time limits for receipt of the tenders and maximum time limits for notice of the results. Six research papers have focused on the tendering phase (see Table 2).

A critical question is whether to announce tenders for all procurements. Both public-private partnerships (PPP) (Lawther & Martin, 2005) and long-term partnerships have been suggested for the public procurement of IS. In competitive tendering, the transaction costs may be high and nullify any financial gains (Hensher & Stanley, 2008). The tendering process in public IS procurements tends to be costly. Contracting authorities are required to publish all tender evaluation criteria and their weights in advance (Mateus et al., 2010). In order to define sound weights, the scoring rules for all evaluation criteria must be defined beforehand, which implies that they are set during the requirements specification. The legislation ensures that more relevant and meaningful information is provided when preparing tenders (Mateus et al., 2010).

More research is warranted on the vendors' work and their challenges in tendering. We have insufficient knowledge about how vendors work to prepare their bids in public procurements of IS. Johannessen et al.'s paper (2012) is one of the few papers that also cover the vendor aspect. They show how a joint effort of innovation between a hospital and a vendor developed into a formal tendering process. The process prohibited all communication between the partners. The paper describes some of the complexity in the process of preparing a bid, which shows that small, innovative firms may lack the capacity to participate in and win tenders. Small- and medium-sized enterprises (SMEs) may also be hindered in the competition due to their lack of legal expertise and administrative resources (Karjalainen & Kempainen, 2008). A study of tender announcements in Sweden (Johansson & Lahtinen, 2012) found that vendors are often left with the task (and the power) of providing the answers as to whether they meet the functionality requirements. This implies a need for communication between the vendor and the procuring entity after tendering, but prior to final selection. However, the study (Johansson & Lahtinen, 2012) does not show how vendors perform the task of providing the answers. We do not know how the vendors demonstrate that they meet the functionality requirements, and whether the correct answers are provided.

The tendering process is important for vendors, who have to fulfill the task of answering the request for proposals. As the "Requirement Specification" section above shows, the specifications may be fuzzy in some parts and too detailed in others. Communication with the procurer may be stifled, which may result in a far from optimal solution; hence, this process is important for both vendor and procurer. This part of the process seems like a "black box", which requires further research. More research is needed on the interplay and communication between the customer and vendor in the public procurement of IS, specifically during the tendering phase.

Selection

The selection phase starts when procurers receive bids from competing vendors, and involves the actual selection of the supplier. For procurements that require a public announcement of tenders, the selection can be based either on the lowest price or the most economically advantageous tender (MEAT). This combines different criteria, including cost effectiveness, aesthetic characteristic (user interface), and after-sales service. All participants should be informed about the award criteria when the request for a proposal is announced.

Currently, the selection phase is the most researched phase. Table 2 overviews the selected papers. A considerable amount of work focuses on decision criteria and optimal solutions (see, e.g., Falagario et al., 2012; Lorentziadis, 2010). Most of these papers are based on some sort of electronic procurement. Findings from two case studies in a Norwegian municipality suggest that vendor qualifications are important in vendor selection (Moe et al., 2006). Furthermore, a study on private and public purchasing of health services shows that, while prior relations plays an important role in selections in the private sector, the public sector almost exclusively relies on transaction-based methods (Lian & Laing, 2004). Open market competition is used in transaction-based methods, and every procurement should be independent of prior relations and procurements. However, the prevailing regulations do have openings for a more relational selection in the public sector.

Pre-defined criteria should be the basis for selection. The public sector may use procurement to stimulate parts of the business community, and specify criteria to promote this effort. Many states in the US have criteria related to promoting the efforts of small businesses, women, and minorities when choosing contractors (Bartle & Korosec, 2003). McCrudden (2004) has also addressed the complexity of balancing competing goals and the use of purchasing power to advance social justice. Procurers may use a variety of social preferences in vendor selection; this issue is also covered in the subsection on requirements specification.

The complexity of balancing goals may increase when more stakeholders are involved. A case study by Howcroft and Light (2002) on packaged software selection discusses the need for user involvement and for compromises on software functionality. The goal difference between different user groups is a focus in a study on decision-making when choosing a vendor and on insourcing systems development projects (Heiskanen et al., 2000). A normative decision model incorporating both pre-qualification and final selection, and involving multiple stakeholders, has also been suggested (Rapsacsák et al., 2000).

One other concern in this phase is the possible information asymmetry between the procurer and vendor. Information asymmetry was found to be prevalent in IS consulting, in a study using the agency theory to identify possible manifestations of opportunism (Dawson et al., 2011). These findings should be of relevance also for IS procurement. Using negotiations as an instrument before choosing the provider is suggested as a guideline (Hensher & Stanley, 2008), and findings from a case study indicate that a negotiated procedure is better suited for IS procurements (Moe et al., 2006). The E.U. regulations actually include tender with negotiations as one of the procedures, and the need for research on if and when this procedure is preferable in public IS procurement is evident. Industry analysts, such as the Gartner Group, are known to influence procurement processes (Pollock & Williams, 2007). Pollock and Williams' study (2007) shows how vendor selection in particular is influenced through market analysis. Further research is needed on the extent to which formal and objective award criteria are applied, and what other criteria play a role in the selection.

Contracting

The contracting phase covers issues such as use of standard contracts, whether to apply a fixed price or a cost-plus price for a scope increase, and how to resolve unclear issues in a contract. One of the challenges in contract issues in IS procurement concerns design uncertainties and how to cover cost overruns. Research findings show that firms with perceived better reputations (Banerjee & Duflo, 2000) have, on average, larger and more complex projects that are harder to design and specify up front. Reputation also matters when using fixed-price or cost-plus contracts (Banerjee & Duflo, 2000). Mathematical modeling and structured interviews with a large sample of Indian software firms form the basis for these findings.

Lessons for public procurement can be drawn based on learning from the construction industry as Tadelis (2012) discusses. The lessons include using cost-plus contracts and selecting a reputable supplier (without competitive bidding) for complex and incompletely specified projects. This contract type results in fewer problems with hidden information at the start of a project because design changes that occur after signing the contract and beginning production are covered. A further issue is the information asymmetry between the procurer and vendor. In their paper covering the whole process, Dawson et al. (2011) present results that apply to contracting. Their model for IS consulting engagements specifies whether a contract should have high or low specificity based on information asymmetry. Transaction costs modeling and the principal-agent theory show that appropriate incentives must be provided for the agent.

Further research is needed on issues such as contract types, and details concerning hidden costs in issues such as training, conversion, and tailoring.

Implementation and completion

As Table 2 shows, I found no study that focuses specifically on implementation or completion of public procurement. However, findings from a case study covering the whole process (including this phase) in the private sector indicate that it can take from three to 12 months to make the selections and up to three years to complete the implementation of ERP systems (Poon & Yu, 2010). This study also shows that corporate governance and more formal project plans might render the procurement process more manageable and shorten the adoption time.

I found one study covering the whole process of procurement of systems development, both in terms of outsourcing and subcontracting software, which may be of specific relevance (Assmann & Punter, 2004). Their findings in this study support the separation of governance into a distinct phase of its own. The analysis (Assmann & Punter, 2004) also shows the complexity of maintaining communications with subcontractors, and the need to feedback information to the subcontractor. These findings may be relevant for public and private IS procurement in general.

The lack of research on implementation and completion is disturbing because there are bound to be challenges in the transition from procurement selection to adoption. Governing the procurement process and communication between the vendor and procurement entity may prove to be critical in the procurement of complex systems, when requirements are difficult to specify. Thus, more research is warranted on implementation and completion. There is a need to research that tasks comprise these phases, how to organize this work, and whom to involve.

Research covering the whole procurement process

I found six papers that cover the whole procurement process. They identify several critical success factors in procurement of ERP systems (Poon & Yu, 2010), including adopting a stakeholder approach when forming the acquisition team, and involving people with prior knowledge of the system type. A stage model of the procurement process for ERP software has been developed based on data from four cases (Verville & Halington, 2003); however, this model ends with the negotiation phase.

A paper covering the whole process (Assman & Punter, 2004) suggests a model for subcontracting software development). This study views the subcontracting or acquisition as a process involving tendering and selection, monitoring, and completion at the end of a product's life span. However, Assman and Punter (2004) focus on the selection phase. They view specifying requirements as critical, and expect requirements to change. They also consider user involvement to be essential.

Theories on power has been applied as a theoretical lens in a study of procurement of a CRM system for a research and consulting firm(Howcroft & Light, 2006). The users of the CRM-system were involved at a rather late stage in the procurement process and the paper shows how power was applied when user resistance emerged. The study further shows how the process goes far beyond selection because the selected vendor may not be able to meet the final requirements.

The role and involvement of different users may vary among countries. A study of software procurement in the private sector in four different European countries revealed that the higher levels of the hierarchy at the customer side are involved in almost every stage of the process in Germany and Switzerland, possibly due to a need for control (Schiessl & Duda, 2007). In Spain and Belgium, however, the management team delegated more, and were less involved in the later phases of procurement.

In their study of information asymmetry in IS consulting, Dawson et al. (2011) found “numerous” instances of what they term signaling and screening during different phases of the process (i.e., prior to putting in bids for the consultant, prior to customer selecting consultant, and during the engagement). In signaling the party with the information advantage conveys meaningful information about itself to the other party, often in hope of achieving a sale or a higher price. Screening is applied by a party who lacks suitable information, to learn about the suitability of the other party. Both client and consultant opportunism was reported to be frequent by the respondents, and Dawson et al. suggest applying for different constraints in the contract (see the “contracting” section).

This study's findings (see Table 2) highlight some of the complexity of IS procurement, and the need to involve different stakeholders and to have a process focus when researching IS procurement. The issue of stakeholder involvement is complex and requires more research on how to involve stakeholders and how to deal with conflicts of interests and different policy goals. The involvement of users from different functional areas has been found to be necessary (Poon & Yu, 2010; Verville & Halington, 2003). A paper on the difference between the public and private sector (Boyne, 2002) highlights the potential for conflicting interests between different stakeholders, which necessitates stakeholder management.

However, the majority of research publications covering the whole process focus on private sector procurement of IS. Only one of the 24 papers I identified cover the whole process of public procurement of IS (Dawson et al., 2011) (see Table 3). However, I do not focus on the procurement of systems per se, but on IS consulting services.

Table 3: Number of Research Articles with a Process Focus Covering a Single Phase, and the Whole Process

| Coverage | Private procurement in general | Private procurement of IS | Public procurement of IS | Process papers in total |
|------------------|--------------------------------|---------------------------|--------------------------|-------------------------|
| Single phase | 6 | 3 | 7 | 16 |
| Complete process | 1 | 6 | 1 | 6 |
| Sum | 7 | 9 | 8 | 24 |

I now examine the research design applied in the studies that I have identified as having a process focus (see Table 3). This shows what methods and approaches have been applied in papers covering the procurement process, and hence, what approaches should be considered in future research.

Research design for articles on the procurement process

Surprisingly, only five of the papers with a process focus on IS procurement actually rely on empirical data from public procurement processes. Table 4 presents the research design and Table 5 shows the period of data collection for all 24 process papers. Very few articles containing quantitative data are available. We can also see that few longitudinal studies have been published and only one has data from multiple cases.

| Research design | No. | Percent | Reference |
|----------------------------|-----|---------|--|
| Survey | 3 | 13 % | Bannerjee and Duflo (2000), Bartle and Korosec (2003), Karjalainen and Kempainen (2008) |
| Action research (AR) | 2 | 8 % | Howcroft and Light (2002, 2006) |
| Interpretive studies | 10 | 42 % | Dawson et al. (2011), Heiskanen et al. (2000), Johannessen et al. (2012), Johansson and Lahtinen (2012), Lawther and Martin (2005), Lian and Laing (2004), Moe et al. (2006), Pollock and Williams (2007), Poon and Yu (2010), Verville and Halington (2003) |
| Mathematical modeling | 6 | 25 % | Falagarío et al. (2011), Hensher and Stanley (2008), Lorentziadis (2010), Mateus et al. (2010), Rapsacsák (2000), Tadelis (2012) |
| Modeling, literature study | 3 | 13 % | Assman and Punter (2004), Schiessl and Duda (2007), McCrudden (2004) |
| Sum | 24 | 100 % | |

Close to half of the papers apply interpretive studies; two apply action research, and only three are based on surveys. However, a closer look at the interpretive studies reveals that most are based on single interviews of different stakeholders after a project is finished, and only five can be classified as truly longitudinal, with data collection being carried out at different intervals during the process.

| Time period | No. | Percent |
|------------------------------|-----|---------|
| No data collection | 7 | 29 % |
| Single snapshot | 9 | 38 % |
| Longitudinal | 4 | 17 % |
| Longitudinal, multiple cases | 4 | 17 % |
| Total | 24 | 101 % |

A closer look at the papers involving data collection shows us that less than a third of the studies apply some type of theory in their analysis of findings (see Table 6 below for an overview).

| | |
|-------------------------------|--|
| Dawson et al. (2011) | Agency theory (see e.g., Eisenhardt, 1989) |
| Heiskanen et al. (2000) | Transaction Cost analysis (see, e.g., Williamson, 1991)) |
| | Saarinen and Vepsäläinen's (1994) framework of procurement strategies |
| | The model of user – developer interaction (Newman & Robey, 1992) |
| Howcroft (2002, 2006) | Lukes' three-dimensional view of power (Lukes, 1974) |
| | The concept of professional power (Markus & Bjørn-Andersen, 1987) |
| Johannessen et al. (2012) | Infrastructuring (see, e.g., Nilsen, 2006)) |
| Lian and Laing (2004) | Transactional based (Campbell, 1985) and relational based paradigms (Ford, 2002) |
| Pollock and Williams (2007) | Theory on decision making (Tierney & Williams, 1990) |
| Verville and Halington (2003) | Organizational Buying Behavior (see, e.g., Geisler & Hoang, 1992)) |



Based on this overview, I stress the need for more interpretive longitudinal studies using a process approach, and for more application of relevant theories.

V. SUMMING UP AND FURTHER WORK

This study's findings highlight the complexity of the process used in public procurement of IS. We see that there are challenges with developing clear, but not too detailed, requirements. We further see that there are dilemmas between specifying the requirements up front, and doing the system specification as an integral part of the procurement process. The findings also show that vendors are left with the task and power of providing the answers to whether they meet the requirements, and communication is prohibited between public procuring entities and vendors. User involvement is highlighted, but goal difference between different stakeholders is a challenge. The process is lengthy and is not over before the systems procured are implemented and the procuring entities acknowledge the contract as fulfilled.

However, we also see that a limited body of research exists on procurement and specific tasks in the process. Based on my findings, I identify major gaps in the prior research on public procurement of IS in both content and in methodology. Content-wise, there are a number of unanswered research questions regarding the whole procurement process. Methodology-wise, there is a lack of longitudinal studies that use a process approach. These gaps are elaborated below.

Content gap

More research is required on all phases of the public procurement process. Table 7 presents several research topics and questions related to the procurement process that need to be addressed. For some of the phases, these questions are quite concrete, but other phases have barely been studied. Each phase may take long time and can be understood as a process in itself. We lack research findings for the phase termed "implementation and completion"; hence, we need to open the black box to understand what actually goes on, what the challenges are, how they are met, and what further challenges these issues may lead to. Only after opening the black box can we know what questions to address.

Table 7: Overview of Areas for Further Research on The Procurement Process

| Focus area | Research questions/topics |
|-------------------------------|--|
| Requirements specification | What problems may the difference in focus between the two stakeholders, the procurer and vendor, lead to? How can this difference in focus be overcome? How are, and how should end users be involved in the requirement specification? How do different stakeholders' goals influence the requirements? How can policy goals be included in the requirements of public procurement of IS? |
| Tendering | "Opening the black box" of what goes on at the vendor side When to choose the different procedures (open tender, restricted tender, tender with negotiations and competitive dialogue), and how does this choice influence the process? |
| Selection | Use of negotiations as part of the process of vendor selection How can procuring entities solve the dilemma between applying policy goals and keeping in line with procurement regulations? |
| Contracting | Dilemmas between the vendors' interests and procuring entities' interests in contracts Issues concerning hidden costs (e.g., training, conversion, tailoring) |
| Implementation and completion | Challenges in the implementation process and in completion of IS procurement projects |
| The whole process | How are the different procedures (tender, tender with negotiations, and competitive dialogue) best carried out? How do different stakeholders play out their policy interests throughout the process? How can different stakeholders and their interests be managed throughout the process? |

More research on the requirements specification in public procurement of IS is also needed. When researching the tendering phase, we need to focus more on the vendor side. It would be useful to study how vendors, and especially SMEs, work to meet tenders for public procurements. One related research area that should be covered is when the different procedures specified in the E.U. regulations (open tender, closed tender, competitive dialogue) should be chosen, and how they are best carried out. These questions are of special interest for competitive dialogue, which is

a new instrument, and which is used to a lesser extent than the other procedures. We also need to study the need for communication beyond the formal announcement of a tender between procuring entities and vendors during requirements specification, selection, and implementation.

Several of the questions relate to different stakeholders (e.g., procuring entity and vendor in contracting) and to dilemmas between different interests (e.g., policy goals and procurement regulations). Research on how different stakeholders play out their interests throughout the process and how to manage these interests, which may prove to be conflicting, is needed.

Methodology gap

Just as important as the research topics is the need for a research approach that matches the research agenda. More studies with a process focus are required, as are more longitudinal studies on the process as a whole. Generally, a lack of focus on process is evident because much of the work is conceptual, analytical, or based on mathematical modeling. Thus, there is a need for a holistic view, for studying public procurement of IS as a process rather than as a sequence of actions. This could prove to be just as crucial as process perspective is in understanding and explaining IS development and technological change (Hekkert et al., 2007; Lyytinen & Newman, 2008; McLeod & Doolin, 2012).

In their case study on technology choice, Pollock and Williams (2007) show that a procurement team may face arguments that come from outside the team's boundaries and they may face controversies. The process of public procurement may not be altogether rational, and, if we limit our research to factor studies of specific decisions, we risk losing much of the story of how and why particular outcomes are attained. Progress in the field will demand process studies (van de Ven, 2007), but process theories and variance theories are not mutually exclusive and should be combined (van de Ven & Poole, 2005).

Newman and Robey's social process approach for research in IS (Newman & Robey, 1992; Robey & Newman, 1996) may prove to be useful. This approach may help explain much of what actually goes on during a procurement process, and hence help in understanding the outcomes. One way of analyzing a process could be through punctuated process modeling (Newman & Zhu, 2009) and by identifying critical incidents, which are incidents that prove difficult or involve conflict to some degree and which can change the outcome of a project. By performing such an analysis, we may be able to identify the interests of different stakeholders and see how they interplay. Moreover, we may be able to identify what actually shapes a process.

A true process approach requires longitudinal data collection from different stakeholders that are involved in public IS procurement projects. We need data from the different stakeholders at different points in time, both during the projects, and after their completion. Data from different events, possibly through first-hand observation, is also required. These data can be analyzed by applying theories such as stakeholder management and dialectics. A longitudinal study is needed to provide these insights.

Research issues in public procurement in general

Beyond the specific gaps described above, research issues also emerge for the broader area of public procurement of IS. More research is needed on issues such as the dilemma between adhering to procurement regulations and applying specific social goals. We do not know to what extent the regulations may open up for applying specific policy goals. We also need to focus more research on how public authorities can apply policy goals and how they influence different phases of the process, especially the requirements specification. In addition, research is vital on how public authorities can apply policy goals and still keep in line with public procurement regulations of transparent and non-exclusive award criteria.

Thai's model (2001) (Figure 3) needs updating. My findings indicate that the processual aspect is of specific importance in public procurement of IS, and we might need a specific model for IS procurement in the public sector. A new model should open up the box termed procurement functions in operations and split it into a separate box for processes and one or more for the other issues (organization, tools, and techniques). Thai's model is a conceptual model, and, by incorporating a separate box for the process, we are developing it into a processual model. That implies a need for research on the links between the process and the other factors, and we need to understand the causal relationships.

I suggest that we need a multiple longitudinal case study on the public procurement of IS covering procurement processes from the start until the systems have been implemented and the procuring entities have accepted that the contract has been fulfilled. Data should be collected through interviews, observations, and project documents. This could open up the black box of some of the phases and answer some of the questions presented in Table 7. I further

suggest that we need to focus on the dilemmas between policy goals and regulations and between the norm of open transparent competition and the goal of procuring the best possible system, whatever that is. In such studies, theories on stakeholder analysis and management and institutional theory could be applied as theoretical lenses.

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