Challenges In Information Systems Procurement in the Public Sector

Carl Erik Moe[1] and Tero Päivärinta[2]
[1]Department of Information Systems, University of Agder
[2]Computer and Systems Science, Luleå University of Technology
Carl.E.Moe@uia.no
Tero.Paivarinta@ltu.se

Abstract. Public procurement constitutes a large part of the market in many countries, and it has the potential of playing an important role in stimulating communities and serving policy goals. With this in mind the governments have set regulations for public procurement. Procurement of Information Systems is especially challenging due to the complexity of procuring unknown technology and the importance an information system has for different stakeholders in an organization. Public procurement of information systems (IS) and services provides several challenges to the stakeholders involved in the procurement processes. However, these are not well established or understood, and there is a knowledge gap that needs to be covered. This paper presents results from a Delphi study, which involved 46 experienced procurement managers, chief information officers, and vendor representatives in the Norwegian public sector. The participants identified 98 challenges related to IS procurement, and subsequently ranked the relative importance of the top issues. The study supports findings from previous research related to diverging stakeholder goals; challenges in balancing between objectives; in requirement specifications; and in too narrow cost focus. In addition to providing empirical confirmation of these previous propositions the study revealed new findings, such as benefits realization in IS procurement; coordinating and standardizing public procurement processes; complex and constraining government regulations; issues of technological integration and compatibility; and inter-municipal cooperation. Developing clear requirements specifications stands out as critical for public sector officials. The results provide a rich overview of IS procurement challenges in the public sector in Norway, and may also give a good picture of challenges in other countries with similar procurement regulations.

Keywords: Public procurement, procurement of information systems, procurement challenges, stakeholder challenges, Delphi study

1 Introduction

Public procurement has been defined as "acquisition (through buying or purchasing) of goods and services by government or public organizations" (Hommen & Rolfstam, 2009, p. 20). It involves significant investments, and plays a major role in the marketplace. Public procurement became more strategic in the 1990s, as it became more common for services to be delivered by contract than through direct employment (Lyne, 1996). The strategic importance of procurement also increases as companies focus on their core competencies and transfer activities to their business partners through outsourcing (Rosemann, 2003).

Procurement of information systems (IS) and related services is challenging compared to acquisition of more standardized goods and services. Information systems often need to be customized to the needs of the public sector (Keiichiro & Hajime, 2005). Procurement decisions are made early in the procurement process, when requirements are still uncertain (Saarinen & Vepsäläinen, 1994). The buyer may have to compare between competing, complex system options. Information systems can support this process (Davila et al., 2003), but research shows difficulties in implementing e-procurement in the public sector (Henriksen & Mahnke, 2005). Furthermore e-procurement offers limited support in the process focusing mainly on the selection of vendors, but less on other parts of the process such as requirements specification, negotiations and contract monitoring.

Our research focuses on information systems that are implemented for specific organizational purposes, such as enterprise resource planning systems and e-services tailored for the buyer's needs. We thus exclude acquisition of off-the-shelf software from this study. Outsourcing of IS development is a relevant issue in our research context, as complex systems often require customization and involve contracting with a vendor to tailor an existing information system or develop a new system altogether.

The public sector also faces slightly different challenges from the private sector. It is often bound by strict regulations concerning procurement and public tendering. For example, most European countries are required to publicly announce a call for tender for all procurements above a certain threshold value. This applies to

member states in the European Union (EU) and in the European Economic area (EEA). In addition, public projects are often large in terms of scope and of volume, which makes them risky. There are several incidents of significant overruns in time and costs, such as the Norwegian Golf defense project (Riksrevisjonen, 2008) or the National Health Service Program for IT in England (Johnson, 2011). The public procurement process is in itself challenging, as is the complexity of procuring new or unknown technology. However, these challenges are not well researched and we seek to fill this gap.

Our research question concerns the challenges and dilemmas that are typically faced in procurement of information systems and related services in the public sector. We carried out a Delphi study with three expert panels related to IS procurement in the Norwegian public sector: procurement managers, chief information officers (CIOs), and vendor representatives. We chose to have three panels because we expected that different stakeholders might differ in their views on the challenges. The expert panels identified and ranked challenges faced in IS procurement in the public sector. Our discussion of the most important challenges contributes to the research literature by confirming some previously identified findings, as well as identifying additional issues that need attention in order to improve public IS procurement.

The rest of the article is structured as follows. Section 2 gives an overview of previous research on public procurement and procurement of IS with a focus on IS procurement challenges previously identified. Section 3 describes the research process. Section 4 summarizes our results and section 5 discusses these in light of the previous research. Section 6 concludes with suggestions for further research.

2 Previous research

Public procurement of Information Systems has gained little attention from researchers, but some of the previous work on public procurement in general carries relevance for our research question. This is introduced below. We summarize also challenges specific to procurement of Information Systems, and provide an overview of the previous literature in table 1 at the end of this section.

2.1 Public procurement

Public procurement can be viewed as a system in action (Thai, 2001) consisting of policy making and management, procurement regulations, authorization and appropriations, and procurement functions in operations. An important line of research has been on management and implementation of procurement policies (Bartle & Korosec, 2003; McCrudden, 2004; Murray, 2001). A common focus of this research is on whether and how procurement can be used as an instrument for specific policies, such as stimulating innovation or development of green products. The research on implementation of the regulations in the public sector also covers the aspect of partnerships with vendors (Gelderman et al., 2006; Martin et al., 1999). These research areas cover public procurement in general and are of relevance to public procurement of IS.

The most complicated element of the system is what Thai (2001) terms “procurement functions in operations”, which includes organizational structure and techniques and methods for the procurement process. A literature review carried out by one of the authors [currently unpublished], shows that there is limited work on this issue in the public sector. Most of this work is on the early phases of the procurement process, such as tendering and vendor selection. The literature review shows that there is less work on contracting, governance, and process focus on public procurement.

One of the previously identified challenges concerns the issue of various internal stakeholders with conflicting goals. Organizational buying involves multiple participants in a process (Wind & Thomas, 2001) where many purchasing decisions are influenced by various members of the buying center (Spekman & Stern, 1979). In addition, the public sector involves the complexity of satisfying needs of different stakeholders. The main distinction between public and private organizations resides in ownership; public agencies are owned collectively by members of political communities, whereas a limited group of entrepreneurs or shareholders owns a private business (Boyne, 2002).

One line of previous work has focused on the challenges of conflicting goals in public procurement. Public procurement must deal with a broad range of issues (Thai, 2006):

- Balancing the dynamic tension between a) competing socioeconomic objectives and b) national economic interests and global competition as required by regional and international trade agreements;

- Satisfying the requirements of fairness, equity, and transparency; and
- Maintaining an overarching focus on maximizing competition.

Thai (ibid.) provides little empirical evidence for this need to balance goals. However, a survey of state procurement and contracting in United States found that a variety of social preferences are used in vendor selection (Bartle & Korosec, 2003); more than half of the sample preferred businesses based in their own state, and some had set-asides for minorities and women-owned businesses. An analysis from Northern-Ireland also provides some support, indicating that public procurement comprises regulatory, commercial and socio-economic goals, and that these are possible to balance (Erridge, 2007).

2.2 Procurement of information systems

There is also the issue of information asymmetry when procuring services from IS consultants (Dawson et al., 2011). Agency theory suggests contracts and monitoring of the work to limit opportunism from a vendor, but this may not be sufficient to cope with the problem as consultants have more knowledge of the problem area than the procurement entity. The challenge of consultant opportunism comes in addition to the challenge of competing interests from internal stakeholders and may necessitate a complex set of strategies.

Findings from public sector IS procurement indicate that regulations and contract arrangements are protective of the government customer, through particular payment models (Doshi, 2005) and use of standard government contracts (Moe et al., 2006). This may limit vendors' interest in participating in public tenders, and less competition may lead to buyers having little choice and less bargaining power.

The contemporary literature on IS procurement challenges and public procurement remains largely without an established theoretical base and there is limited empirical data to validate the conceptual and normative recommendations. The literature identifies a number of potential challenges, but there is little systematic research on additional challenges in public IS procurement. A study of 4 ERP procurements in private sector shows the importance of adopting a stakeholder approach (Poon & Yu, 2010). The challenge of different stakeholders may be more important in the public sector than in private sector, but there is limited research on how it interplays with other challenges. The main findings from previous research on challenges related to public procurement and procurement of Information Systems are summed up in in Table 1. The table further shows the research approach and the analytical lens for these studies.

Table 1: Summary of findings from previous research on public procurement and procurement of IS

Challenge	Proposition	Type of study	Theory
Various internal stakeholders Public agencies face a variety of stakeholders, placing demands and constraints on managers (Boyne 2002)	Demands and constraints from different stakeholders may be in conflict	Literature review	Stakeholder theory
Gaps between project goals and stakeholder goals, both internal and external (Pan 2005)	Underestimation of stake-holder groups may lead to problems in terms of resistance	Case study of development of information system (for e-procurement	
Governance of procurement processes over time (Poon & Yu, 2010)	Adopting a stakeholder approach and preparing evaluation criteria are critical success factors	Case study of 4 ERP procurements in private companies	Micro-politics
Information asymmetry (Dawson et al., 2011)	Consultants are difficult to control through contracts due to information asymmetry; there are more opportunities for opportunism	Interviews with 15 experienced IS consultants and procurers	Agency theory, principal-professional lens

Challenge	Proposition	Type of study	Theory
Limited interest from vendors, due to payment model and standard government contracts	Not enough competition, and the buyer may not be able to get optimal price or quality	Analysis of guidance and model contracts for UK government IT projects (Doshi, 2005) Case study of two public IS procurements (Moe et al., 2006)	No specific theory
Public procurement balances between socio-economic objectives (Thai, 2001) Public entities have more ambiguous goals Local vendors and vendors representing minorities may be favored	This may create dilemmas between conflicting goals	Subsequent research supports Thais (2001) claim. Boyne (2002) finds support for ambiguous goals in literature review Bartle and Korosec (2003) find that social preferences are used by American state governments	Conflicting goals; these conflicts can be between different stakeholders
Specifying requirements before announcing tender Information Systems may have ill-defined scope and unclear requirements	The requirement may ask for the wrong system	Case study of two public IS procurements (Moe et al., 2006) Findings from two cases indicate that partnership may be better suited to complex procurements (Lawther & Martin, 2005)	None
Focusing on lifecycle cost and not just initial procurement costs	If managers do not adopt a long-term perspective for valuation, they may end up with higher lifecycle costs	Survey from materials procurement in Norwegian Army (Tysseland, 2008)	Agency theory, information asymmetry, project uncertainty

We saw a need for research to identify and prioritize the challenges and assess how they are related. We chose the Delphi method for our research, this can be used to develop an overview of what challenges and problems are most prominent in a field (Okoli & Pawlowski, 2004). In this context, the challenges represent factors that may have negative impact on the success of a procurement process and in the resulting system.

3 Research method

We chose to follow the process steps recommended for ranking-type Delphi studies (Okoli & Pawlowski, 2004; Schmidt, 1997) in order to identify, select, and rank the observed problems and challenges.

The Delphi method is useful in complex, immature fields involving expert judgment (Gupta & Clarke, 1996; Rowe & Wright, 1999). It fits especially well in situations where the experts are geographically scattered (ibid.). The method formalizes communications between researchers and experts in order to extract unbiased information based on the experts' opinions. The key features that characterize the Delphi method are anonymity, multiple iterations, controlled feedback, and statistical aggregation of the group response (Rowe & Wright, 1999). Potential disadvantages include lengthy process, potential researcher influence on responses based on formulation of the questions, and difficulties due to the fact that the experts never meet in person (Murry & Hammons, 1995).

3.1 Composition of the expert panels

First we selected the experts for the study. We limited ourselves to inviting practitioners only, from different types of public entities of a reasonable size (municipalities, government-run entities such as hospitals, and entities in central government). We also selected experts from vendors who provide systems and services to the public sector and have a considerable portion of this market. Our design involved three expert panels:

procurement managers, chief information officers (CIOs), and representatives of vendors. While we considered involving politicians (representing citizens in public organizations) and end-users, we soon realized that these stakeholders were less involved in the actual procurement processes.

We required our experts to have minimum three years of experience in their current position or in a similar position, with procurement responsibility (or sales in the case of vendors). We also required experience from minimum three procurement processes of information systems or services in the public sector. We contacted the experts, whom we knew from previous projects or through professional networks by e-mail and phone, inviting them to participate and explaining the purpose and process of our research. We further asked them to nominate other experts who satisfied our selection criteria, and we contacted the largest municipalities in the country.

The procurement manager panel included 18 participants, the CIO panel 17 participants, and the vendor panel 11 participants. Most of the CIOs and procurers came from municipalities (28); the remainder worked in health care organizations, regional public administration, or state government. The vendor experts were from consultancies, software houses offering niche systems (e.g. systems for social services); or general software houses.

3.2 Data collection and analysis

We divided the data collection process into three phases: brainstorming, narrowing-down, and ranking, as recommended by Schmidt (1997) and Okoli & Pawlowski (2004).

3.2.1 Brainstorming

In the first phase we brainstormed issues related to the research question. We sent a welcome letter to the participants by e-mail. Each expert was asked to list at least six challenges for or dilemmas of public IS procurement. We asked them to give each challenge a name, a definition, the causes for each challenge and the consequences that would occur if they were not managed. By answering this, the experts gave a structured explanation of each challenge. For example, one challenge is writing clear requirements specifications. One CIO explained that this was due to the strict requirements for tender format and the low threshold for official complaints. This could lead to the vendors taking advantages of shortcomings in the specification, and to the procuring entity ending up with making the wrong choices. One of the procurement managers explained that the challenge was caused by a lack of holistic understanding of the business processes, and this could lead to a lot of change orders and to procurement of modules that are not implemented.

The experts e-mailed their lists to us directly, thus remaining anonymous to each other. After collecting the replies, we combined the issues into a single list, removed exact duplicates, and unified terminology. We collated the responses independently, before comparing and consolidating the individually constructed lists. We sent our consolidated list of 96 challenges back to the experts to ensure we had not eliminated any challenges in this phase and that we had not misinterpreted any issues. This step resulted in the addition of two more items. The entire consolidated list of 98 challenges and dilemmas from the brainstorming is presented in Appendix A.

3.2.2 Narrowing down the results

In the second phase we narrowed the list down to a manageable number of the most important issues. In each panel, each expert defined around 20 issues that they considered the most important. The presentation order of the full list of issues was randomized to avoid bias in selection of the most important challenges, based on a factor's sequence in the list.

This phase resulted in a list of 19 issues, which were selected as follows. First, we selected a "top ten" list based on the votes in total across the three panels. This resulted in 13 challenges in total, as the challenges ranked from 10 to 13 got the same number of votes. Then we checked whether there were large differences between the panel selections. Kendall's tau (a measure to study ranking correlations between different panels) values showed some correlations between the panels selections for the narrowed-down lists. However, all the correlations were less than 0.5 (Table 2), and values below this threshold is a sign of two rankings not being relatively similar. So we decided to include challenges chosen by more than 50% (Schmidt, 1997) of members

in each particular panel. This step assured that each panel had its challenges represented in the narrowed-down list. It resulted in six additional challenges to be included for further analysis, giving a total of 19 in the list.

3.2.3 Ranking

In the third phase the relative importance of the top 19 issues were ranked. Since the Kendall's tau values between all the pairs of the panels were below 0.5, we chose to do the ranking separately for all the three panels. By dividing the experts into three separate panels, we expected to reveal potential differences in challenges between these three stakeholder groups.

The third phase was carried out in two rounds. In Delphi studies, the number of ranking rounds should depend on whether each panel reaches either an acceptable level of consensus or a state where the level of consensus stagnates. Kendall's coefficient of concordance (*W*) was used to measure the level of consensus within each of the panels.

The results from the first round of ranking were fed back to the panel members. They were asked to reflect on their ranking compared to the group's average, and then re-rank the challenges. Kendall's tau values on the first ranking round (Table 2) showed some interesting results. While the top issues from the narrowing-down phase correlated between all panels to some extent, the dissensus between the vendor panel and the two other panels increased after the ranking rounds. The vendors' selection did not correlate significantly with the two other groups. The procurers' and CIOs' rankings continued to correlate, however some factors were very differently valued by the two panels. Hence, a panel-wise discussion and comparison of the ranking results is legitimate.

Schmidt (1997) recommends a concordance level of $W = 0.7$ to indicate a high level of agreement among the respondents in each panel. Ideally, the ranking rounds should continue either until that level is reached, till the concordance level does not increase further between two consecutive ranking rounds, or till one more round is no longer considered feasible (Schmidt, 1997). We decided to stop ranking after two rounds, due to several indications that the panel members were not willing to participate in more rounds. We had to send several reminders on the second round, and expected to lose more panel members if we continued one more round. One representative of the vendor group had dropped out of the study between the first two rounds, and more dropouts would have weakened the reliability of yet another ranking. We had gained a moderate consensus ($W > 0.5$) in two of the groups (procurement managers and vendors), whereas the CIO group consensus was low ($W > 0.3$) to moderate (Tables 3-5). The biggest relative changes within each panel were maximally two positions up or down, so we are confident our results correctly ranks the issues most important to the panelists.

Table 2: Kendall's tau values between the three panels

	Procurers*CIOs	Procurers*Vendors	CIOs*Vendors
Narrowing-down phase (all 98 items)	0.474 (sig. 0.000)	0.205 (sig. 0.006)	0.234 (sig. 0.004)
Ranking round 1 (top 19 items)	0.471 (sig. 0.002)	-0.106 (sig. 0.585)	-0.076 (sig. 0.710)
Ranking round 2 (top 19 items)	0.450 (sig. 0.008)	-0.112 (sig. 0.584)	-0.088 (sig. 0.681)

4 Results

The following tables present challenge rankings after the first and second round for each of the three panels. There were some minor changes in the ranking order between the first and second round, but overall the top-ranked challenges had a higher score (closer to 1), and the lower-ranked challenges had a lower score (closer to 19) in the second round.

As the results in tables 3-5 below show, the three groups ranked challenges somewhat differently. "Change of work processes and benefits realization" was ranked as the most important challenge by procuring officers, with an average ranking of 2.2. CIOs ranked "Clear requirements specification" as the most important

challenge, with an average ranking of 4.3. This challenge was not considered much more important than the next two challenges. "Finding and using good assessment criteria" received an average ranking of 4.5, and "Integration, compatibility" received an average ranking of 4.6 from the CIO´s. Vendor representatives differed from these two groups, ranking "Too much focus on costs" as the most important challenge with an average of 2.0.

Table 3: Ranking results: Procurement managers

Challenge		Mean ranks	
Rank	Issue	Round 1 (N=18)	Round 2 (N=18)
1.	Change of work processes and benefits realization	5.0	2.2
2.	Clear requirements specification	7.1	4.7
3.	Integration, compatibility	7.9	5.1
4.	Lack of coordination and standardization	8.1	6.1
5.	Weighing / prioritizing the assessment criteria	8.2	6.4
6.	Complete requirements	8.7	7.6
7.	Frame agreements	9.5	7.9
8.	Procurement competence	8.9	8.4
9.	Cooperation between different stakeholders	10.1	8.8
10.	Tendering obligations may conflict with long-term planning	10.1	10.6
11.	Monopoly-resembling vendor conditions	10.3	11.2
12.	Too much focus on costs	10.6	11.3
13.	Municipal cooperation is challenging	11.0	11.7
14.	Finding and using suitable assessment criteria	11.0	12.5
15.	Partnership and innovation are hindered	11.2	13.3
16.	Complex regulations	12.6	14.9
17.	Vendors tend to oversell	12.7	15.0
18.	The vendors don't get to show their qualities	14.1	15.4
19.	Feasible requirements	13.0	15.7
	Kendall's *W*	0.160	0.537

Table 4: Ranking results: CIOs

Challenges		Mean ranks	
Rank	Issue	Round 1 (N=17)	Round 2 (N=17)
1.	Clear requirements specification	6.4	4.3
2.	Finding and using good assessment criteria	6.5	4.5
3.	Integration, compatibility	5.1	4.6
4.	Lack of coordination and standardization	8.2	7.4
5.	Weighing / prioritizing the assessment criteria	8.9	7.8
6.	Partnership and innovation are hindered	8.4	8.2
7.	Change of work processes and benefits realization	7.5	8.5
8.	Too much focus on costs	8.3	9.3
9.	Tendering obligations may conflict with long-term planning	9.8	9.5
10.	Complex regulations	9.8	9.6
11.	Frame agreements	9.3	9.8
12.	Cooperation between different stakeholders	10.1	10.4
13.	Procurement competence	11.0	11.1
14.	Complete requirements	12.2	12.2
15.	Municipal cooperation is challenging	11.2	12.5
16.	Vendors tend to oversell	12.8	13.8
17.	Monopoly-resembling vendor conditions	13.3	14.4
18.	The vendors don't get to show their qualities	15.5	15.9
19.	Feasible requirements	15.6	16.2
	Kendall's *W*	0.268	0.391

Table 5: Ranking results: Vendors

Challenges		Mean ranks	
Rank	Issue	Round 1 (N=11)	Round 2 (N=10)
1.	Too much focus on costs	2.7	2.0
2.	Feasible requirements	6.5	5.0
3.	The vendors don't get to show their qualities	6.5	5.1
4.	Change of work processes and benefits realization	6.6	5.5
5.	Cooperation between different stakeholders	7.3	6.0
6.	Partnership and innovation are hindered	9.0	7.8
6.	Complex regulations	8.5	7.8
8.	Procurement competence	8.8	8.6
9.	Weighing / prioritizing the assessment criteria	9.1	8.7
10.	Tendering obligations may conflict with long-term planning	9.6	10.2
11.	Lack of coordination and standardization	10.7	11.0
12.	Clear requirements specification	10.8	11.1
13.	Complete requirements	11.4	11.9
14.	Frame agreements	12.3	13.3
15.	Municipal cooperation is challenging	11.8	14.0
16.	Finding and using suitable assessment criteria	14.7	15.0
16.	Integration, compatibility	13.4	15.0
18.	Monopoly-resembling vendor conditions	14.9	15.5
19.	Vendors tend to oversell	15.5	16.9
	Kendall's *W*	0.354	0.563

The Kendall's tau values (Table 2) shows the similarity between the three panels. The correlation was statistically significant between procurement officers and CIOs, with a value of 0.450. However, as the value is below 0.5 there is not a high level of agreement and it made sense to have separate panels. The correlation was even smaller between the internal stakeholders (procurers and CIOs) and the vendor representatives. We will explore the differences between the panels further in our discussion section.

Finally, Kendall's *W* values in Tables 3, 4, and 5 indicate the level of consensus between different members of each panel after both rounds of ranking. The consensus increased in all three groups from the first to the second round. Yet another round might have led to a loss of respondents without the consensus increasing all that much.

5 Discussion

We discuss our findings in light of previous research and whether prior findings (Table 1) are confirmed. More importantly, we identify challenges that have not been highlighted before. Our results are all from Norway, but we would argue that they may be equally valid for other countries with the EU/EEA procurement regulations or similar regulations.

5.1 Relationship to previous results

Several of the main findings relate to stakeholder issues. The different stakeholders had differing views on the procurement challenges, the Kendall's tau values showed clear differences between the three panels. This difference between the stakeholders may in itself be a challenge. If we had included internal users as yet another stakeholder group in our panels, we might have found further differences.

We also found that vendors ranked the issue of cooperation between stakeholders among the top five challenges. This confirms previous findings on stakeholder issues being important in e-.(Flak et al., 2008; Flak & Rose, 2005; Rowley, 2011).

At least one of the other challenges may also be related to conflicting stakeholder demands: the issue of municipal cooperation, which involves stakeholders from more than one municipality. Municipal collaboration on procurement and on certain services is an important issue in parts of the Norwegian municipal sector, due to a high number of fairly small municipalities. Some networks of neighbor municipalities run joint procurement processes, where they negotiate better prizes, and move to a more shared portfolio of Information Systems.

This was not rated among the top five challenges by any of the groups, it could be due to our sample of respondents from public sector, some of them were from regional governments or hospitals, and for them this challenge is irrelevant.

The panels did not highlight any issues related to information asymmetry with consultants, even though we asked for challenges in procurement of information systems and IS services, including consulting. The issue "Vendors trying to oversell", may be related to information asymmetry. This was in the narrowed down list, but it was ranked consistently low. On the other hand, our findings did not suggest that gaps between stakeholder goals and project goals were a challenge (Pan 2005).

Our data suggested that balancing between different objectives (Thai 2001) and goal ambiguity (Boyne 2002) is a challenge. The terms were not used in our consolidated list, but vendor respondents point to feasible requirements, i.e., customers are asking for more than they plan to use, as one of their top challenges (2). According to one vendor, this challenge is due to "Many stakeholders being involved in the early parts of the procurement process; they all have their wish list, and no one takes charge of prioritizing and shortlisting". We did not find support for favoring of local vendors and minorities as a challenge. This was surprising, as the vendor representatives in our sample were mainly from the big national vendors, and should be inclined to bring up the issue if they felt it caused them to lose contracts. Partnership and innovation was also an issue, especially for the CIOs (6) and the vendors (6). Transparency for ensuring fair competition between vendors is clearly a public-sector-specific challenge; private firms can be more pragmatic on these issues.

We were surprised to find that our participants did not identify "uninterested vendors" on the list of nominated challenges, as previous research has suggested (Moe et al., 2006). However in the brainstorming one of the vendors listed expensive process due to complex regulations as a challenge and remarked that as a consequence large companies decide not to compete for procurement tenders in small municipalities in more remote areas. And none of the experts mentioned the possibility of smaller vendors not being able to take part due to the costs of the process, and the risk of not being selected. This may be due to our selection of vendor representatives; we invited only vendors who already sell a lot to the public sector.

Our results confirm "Specify requirements before announcing tenders" as an important challenge. Our panelists have used other denominators that are clearly linked. They see developing "Clear requirements" as one of the key challenges. The regulations normally require procurement entities to develop requirement specifications without talking to vendors. A procuring entity may have limited knowledge of what to ask for in a niche area. And they are dealing with experienced vendors who know their software. This challenge of developing "Clear requirements" is rated high both by procurement officers (2) and by CIOs (1). Our panelists also brought up the issue of "Complete requirements," which they ranked slightly lower (rank 6 and 14, respectively).

The regulations concerning public procurement may partly explain why these issues are so important. Tendering is the most common way for the public sector to procure information systems, and previous research has shown the dilemma concerning specifying requirements before talking to the vendors (Moe et al., 2006). The vendor panels had a slightly different view on the challenges, highlighting feasible and realistic requirements from their customers, but were less concerned with getting the specifications completely and clearly. It may not be in all vendors' interest to have clear and complete requirement specifications, as this may give them less leeway when creating their bid.

A main challenge for the vendors is rather to get an opportunity to show their qualities. The very detailed requirement specifications would limit these possibilities.

Vendors viewed "Focusing on initial procurement costs instead of life cycle costs" as the top challenge, hence the previous finding (Tysseland, 2008) is supported. In the brainstorming some of the panelists explained this challenge and the consequences of not solving it.

According to one, the inherent processes in the systems are not evaluated as part of the selection. Only costs for investment, user support and maintenance.

5.1 New findings

There are some interesting new findings in the lists of top challenges (tables 3-5). Experts across all three panels rated the issue of facilitating change in work processes and benefits realization as the most important procurement-related challenge (1, 7, and 4). This finding supports the benefits realization literature (e.g., (Ward & Daniel, 2006), which highlights the importance of planning from early on for benefits from IS investments. Procurement managers actually ranked change management of work processes and benefits realization as the top challenge. This may be somewhat surprising, as the change of work processes starts after a contract is signed and the responsibilities of the procurement personnel are finished. The issue has not been identified in previous literature. However, the challenge of establishing benefits realization practices from IT investments in the public sector has been identified in other studies (Päivärinta & Dertz, 2008; Päivärinta et al., 2007). The issue of benefit realization and lack of achieved benefits has also been highlighted in the eGovernment research(Gilbert et al., 2004; Moon, 2002).

Our results indicate a need for further research and for education on benefits realization practices in connection to IS procurement in the public sector.

The issue of technological integration and compatibility of purchased systems was ranked third both by the procurement managers and the CIOs. This is a technical challenge, relating to questions like interoperability. Lack of integration results in siloed systems. Interoperability has been high on the agenda in the eGovernment field, and it is believed to be the most critical issue facing businesses that need to access information from multiple information systems (Park & Ram, 2004). Municipalities tend to have a large amount of information systems covering the needs of very diverse sectors.

There is an increasing pressure on government agencies to act in a more collaborative and integrated manner (Ryan & Walsh, 2004), which necessitates data exchange from municipalities to central government.

Lack of coordination and standardization of the procurement process was ranked as the 4th most important challenge by both procurement personnel and CIOs. In order to understand this issue we have to take into account the sample in these two panels, which were largely made up of employees in municipalities.

A need for coordination and standardization of IS procurement processes may be specific to countries with many small municipalities, However, this issue was consistently ranked high also among the panel participants from public hospitals and central government.

Finding and using good assessment criteria and weighing/prioritizing the assessment criteria were also high on the agenda of the internal stakeholders. This may be related to the need to stick to the requirement specifications due to the formal tendering process, and to the possibility of vendor complaints. In addition, rules and regulations were seen as hindering longer-term vendor-customer partnerships, both by CIOs and vendors (6). Longer-term cooperation could give some benefits such as less scope for opportunism from the vendors (Parker & Hartley, 2003), and trust relationships and coordinated strategies between buyers and suppliers (Parker & Hartley, 1997).

5.2 Implications for research and practice

Considering the overall differences between the panel prioritizations, our study supports Pan's (2005) suggestions for improving stakeholder management in public IS procurements. The classic challenge of coordinating between various stakeholders in procurement in general (Spekman & Stern, 1979) and in the public sector IS investments (Pan, 2005) emerged as one of the major challenges. Our results support previous calls for more focus on managing these challenges in public procurement practices and processes.

The experts further highlight the importance of clear, complete, and feasible requirements specifications. Increased focus on requirements specifications may be especially important for the public sector, since regulations specify tendering as the default procurement instrument and requirements generally have to be specified before inviting vendors to bid (Moe et al., 2006). This regulation-initiated requirement may be even more challenging, as software engineering and information systems literature since the 1970s has recognized the difficulty in defining "complete" and "clear" ex-ante requirements, requirements tend to change during development (e.g. (Parnas, 1979). Our data confirms that this dilemma still has to be solved in the public sector. One possible solution could be more use of competitive dialogue, where vendors are invited to participate in a competition and in a dialogue with the procuring entity before the requirements are fully specified.

The challenge of technological integration and system compatibility highlights the importance of involving IT expertise in the procurement process. In small countries, some vendors may have reached a "monopoly-like" position in some niche areas specific to public sector. On the other hand, due the regulations and strong focus on defining ex-ante requirements, vendors may have few opportunities to show their unique qualities, if the customers do not request these qualities specifically. The challenge of inter-municipal cooperation may be a case characteristic to Norway; municipalities have been rather independent with regard to their IT/IS implementations, and quite a few participate in inter-municipal procurement networks.

6 Conclusion and further work

This Delphi study revealed typical challenges for IS procurement in the Norwegian public sector. Three expert panels defined 98 challenges and dilemmas, divided into 13 categories: requirements specification, change management, cooperation among stakeholders, competence, competition, contracting, inter-municipal cooperation, governmental management, procurement process, rules and regulations, technology and infrastructure, vendors, and IT governance. The results provide a rich overview and complement the previous, largely conceptual and case-based literature on public IS procurement challenges.

The study supports previously identified challenges related to stakeholders and to balancing between their objectives related to requirement specifications. All relevant stakeholder groups should be involved in procurement projects. More research is needed on issues such as stakeholder management and on balancing different goals without asking for more than is needed. The interplay between procurers and vendors in public procurement has not previously been much researched. This interplay may not function very well in public sector due to recurring competitions and complex regulations.

One especially important issue is the conflicting interest of procurers and vendors. Procurement personnel strive for complete and clear requirements specifications, at the same time vendors seem to prefer less detailed specifications this would give them more room for showing qualities that are not mentioned in the request.

In addition, the study revealed challenges that have not been discussed previously in connection to public IS procurement, such as aligning benefits realization to procurement. The study further supports previous findings on plain focus on costs. If procurement managers and CIOs want to achieve benefits from investments in new systems, they need to balance the focus on cost with the need for quality, and they need to give room for vendors to show their qualities.

The challenge of complex and constraining regulations was also prevalent. This may make the process more complex and costly than needed, and may also hinder SMEs from participating. Lack of coordination and standardization was also revealed. Public procurement of Information Systems is a complex task, and many years can go by between subsequent projects in one professional domain, before new systems are bought, hence help should be needed. The problem could be overcome by copying successful procurement processes from other government entities or collaborating municipalities. However there may be risks with in doing this.

Our further work will also focus on creation of cause-effect relationships between the most commonly observed issues through qualitative analyses of the brainstormed data and through additional fieldwork. Another natural avenue for further work resides in cross-country studies, which might reveal more information about generalizability of these results to other countries with equally strict procurement regulations.

References

Bartle, J. R., & Korosec, R. L. (2003). A review of state procurement and contracting. Journal of Public Procurement, 3(2), 192-214.

Boyne, G. A. (2002). Public and Private Management: What`s the difference? Journal of Management Studies, 39(1), 97-122.

Davila, A., Gupta, M., & Palmer, R. J. (2003). Moving Procurement Systems to the Internet: The Adoption and Use of E-Procurement Technology Models. European Management Journal, 21(1), 11-23.

Dawson, G. S., Watson, R. T., & Boudreau, M.-C. (2011). Information Asymmetry in IS Consulting: Towards a Theory of Relationship Constraints. Journal of Management Information Systems, 27(3), 143-178.

Doshi, B. (2005). The new OGC guidance: The future roadmap for government IT procurement. Computer Law and Security Report, 21(4), 344-348.

Erridge, A. (2007). Public Procurement, Public Value and The Northern Ireland Unemployment Pilot Project. Public Administration, 85(4), 1023-1043.

Flak, L. S., Nordheim, S., & Munkvold, B. E. (2008). Analyzing stakeholder diversity in G2G efforts: Combining descriptive stakeholder theory and dialectic process theory. e-Service Journal, 6(2), 3-23.

Flak, L. S., & Rose, J. (2005). Stakeholder governance: adapting stakeholder theory to the e-government field. Communications of the Association for Information Systems, 16, 642-664.

Gelderman, C. J., Ghijsen, P. W. T., & Brugman, M. J. (2006). Public procurement and EU tendering directives - explaining non-compliance. International Journal of Public Sector Management, 19(7), 702-714.

Gilbert, D., Balestrini, P., & Littleboy, D. (2004). Barriers and benefits in the adoption of e-government. International Journal of Public Sector Management, 17(4), 286-301.

Gupta, U. G., & Clarke, R. E. (1996). Theory and applications of the Delphi technique: a bibliography (1975-1994). Technological forecasting and social change, 53, 185-211.

Henriksen, H. Z., & Mahnke, V. (2005). E-Procurement Adoption in the Danish Public Sector: The Influence of Economic and Political Rationality. Scandinavian Journal of Information Systems, 17(2), 85-106.

Hommen, L., & Rolfstam, M. (2009). Public Procurement and Innovation: Towards a Taxonomy. Journal of Public Procurement, 9(1), 17-56.

Johnson, C. W. (2011). Identifying common problems in the acquisition and deployment of large-scale, safety-critical, software projects in the US and UK healthcare systems. Safety Science, 49(5), 735-745.

Keiichiro, I., & Hajime, M. (2005). How Local Governments Should Procure Information Systems? (Abstract in English). Proceedings of the 19th Annual Conference on JSAI. 2E3-01

Lawther, W. C., & Martin, L. L. (2005). Innovative practices in public procurement partnerships: The case of the United States. Journal of Purchasing and Supply Management, 11(5-6), 212-220.

Lyne, C. (1996). Strategic procurement in the new local government. European Journal of Purchasing and Supply Management, 2(1), 1-6.

Martin, S., Hartley, K., & Cox, A. (1999). Public procurement directives in the European Union: A study of local authority purchasing. Public Administration, 77(2), 387-406.

McCrudden, C. (2004). Using public procurement to achieve social outcomes. Natural Resources Forum, 28(4), 257-267.

Moe, C. E., Risvand, A. K., & Sein, M. K. (2006). Limits of Public Procurement: Information systems acquisition. Electronic Government - 5th International Conference, EGOV 2006, Krakow. Springer Verlag, LCNS 4084, 281-292.

Moon, M. J. (2002). The Evolution of E-Government among Municipalities: Rhetoric or Reality? Public administration review, 62(4), 424-433.

Murray, J. G. (2001). Local government and private sector purchasing strategy: a comparative study. European Journal of Purchasing & Supply Management, 7(2), 91-100.

Murry, J. W., & Hammons, J. O. (1995). Delphi: a versatile methodology for conducting qualitative research. Review of higher education, 18, 423-436.

Okoli, C., & Pawlowski, S. D. (2004). The Delphi method as a research tool: an example, design considerations and applications. Information & Management, 42(1), 15-29.

Pan, G. S. C. (2005). Information systems project abandonment: a stakeholder analysis. International Journal of Information Management, 25(2), 173-184.

Park, J., & Ram, S. (2004). Information systems interoperability: What lies beneath? ACM Transactions on Information Systems (TOIS), 22(4), 595-632.

Parker, D., & Hartley, K. (1997). The economics of partnership sourcing versus adversarial competition: a critique. European Journal of Purchasing & Supply Management, 3(2), 115-125.

Parker, D., & Hartley, K. (2003). Transaction costs, relational contracting and public private partnerships: a case study of UK defence. Journal of Purchasing & Supply Management, 9(3), 97-108.

Parnas, D. (1979). Designing Software for Ease of Extension and Contraction. IEEE Transactions on Software Engineering, 5(2), 128-138.

Poon, P.-L., & Yu, Y. T. (2010). Investigating ERP systems procurement practice: Hong Kong and Australian experiences. Information and Software Technology, 52(10), 1011-1022.

Päivärinta, T., & Dertz, W. (2008). Pre-Determinants of Implementing IT Benefits Management in Norwegian Municipalities: Cultivate the Context. Electronic Government - 7th International Conference, EGOV 2008, Torin. Springer Verlag LCNS 5184, 111-123

Päivärinta, T., Dertz, W., & Flak, L. (2007). Issues of Adopting Benefits Management Practices of IT Investments in Municipalities: A Delphi Study in Norway. Proceedings of the 40th Annual Hawaii International Conference on System Sciences (HICSS).

Riksrevisjonen. (2008). Riksrevisjonens oppfølging av forvaltningsrevisjoner behandlet av Stortinget. Retrieved 12.08, 2009, from http://www.riksrevisjonen.no/NR/rdonlyres/3AC09C1F-1BFD-40D3-B278-5186BB6D548D/0/Dok_3_1_2007_2008.pdf

Rosemann, M. (2003). Procurement. In H. Bidgoli (Ed.), Encyclopedia of Information Systems (pp. 505-516): Elsevier Academic Press.

Rowe, G., & Wright, G. (1999). The Delphi Technique as a forecasting tool: issues and analysis. International Journal of Forecasting, 15, 353-375.

Rowley, J. (2011). e-Government stakeholders—Who are they and what do they want? International journal of Information management, 31(1), 53-62.

Ryan, C., & Walsh, P. (2004). Collaboration of Public Sector Agencies:Reporting and Accountability Challenges. International Journal of Public Sector Management, 17(7), 621-631.

Saarinen, T., & Vepsäläinen, A. P. J. (1994). Procurement Strategies for Information Systems. Journal of Management Information Systems, 11(2), 187-208.

Schmidt, R. C. (1997). Managing Delphi Surveys Using Nonparametric Statistical Techniques. Decision Sciences, 28(3), 763-774.

Spekman, R. E., & Stern, L. W. (1979). Environmental Uncertainty and Buying Group Structure: Empirical Investigation. Journal of Marketing, 43(Spring), 55-64.

Thai, K. V. (2001). Public procurement re-examined. Journal of Public Procurement, 1(1), 9-50.

Thai, K. V. (2006). Advancing Public Procurement: Practices, Innovation and Knowledge Sharing. In K. V. Thai & G. Piga (Eds.): PrAcademics Press.

Tysseland, B. E. (2008). Life cycle cost based procurement decisions. A case study of Norwegian Defence Procurement projects. International Journal of Project Management, 26(4), 366-375.

Ward, J., & Daniel, E. (2006). Benefits Management: Delivering Value from IS & IT Investments. Chichester: Wiley.

Wind, Y., & Thomas, R. J. (2001). Conceptual and Methodological Issues in Organisational Buying Behaviour. European Journal of Marketing, 14(5/6), 239-263.

Appendix A: Complete list of challenges

Category		**Challenge**	**Explanation**
1. Requirement specification			
Quality	1.1	Clear	Difficult to define clear and objective requirements.
	1.2	Complete	Incomplete req. specifications
	1.3	Feasible	Customers ask for more than they plan to apply
Content	1.4	User support as part of the requirement specification	Get optimal user support from the vendor
	1.5	Operations as part of the requirement specification	
	1.6	Requirement for specific technologies	Require for instance ASP or cloud computing
Process for developing the req. specification	1.7	Based on process improvements	Make a requirement specification based on, e.g., a process map or use-cases
	1.8	Verified requirements specification	
	1.9	Balanced/prioritized between different needs	
	1.10	Allocation criteria	Difficult to develop criteria for allocating contracts
2. Change management	2.1	Change of work processes and benefit realization	Difficult to achieve change of work processes and of the organization and to realize the possible benefits
	2.2	Resistance to change	

	2.3	User training for new systems and work processes	The need for training is not estimated properly
3. Different stakeholders, cooperation	3.1	Involvement of procurement personnel	Procurement of information systems may be done without involving the group with procurement competence
	3.2	Gathering of key personnel for the procurement process	Gather personnel with the critical knowledge
	3.3	Cooperation between different stakeholders	Different government sectors or business units have to cooperate, without understanding each other´s needs
	3.4	Differing viewpoints and interest in assessment criteria (of the vendor)	Need to find common criteria
	3.5	Conflict	Conflict between different business units
	3.6	Citizen focus	Not enough concern for “customers”
4. Competence	4.1	Procurement competence	
	4.2	Competence in rules and regulations	
	4.3	Judicial competence	
	4.4	Financial competence	
	4.5	Competence in negotiations	
	4.6	Product competence	
	4.7	Competence in license issues	
	4.8	Domain competence	
	4.9	Competence in existing systems and infrastructure	
	4.10	Competence in installation, testing and supplier responsibilities	
	4.11	The supplier’s competence	
5. Competition	5.1	Lack of methods for evaluation	
	5.2	Find good criteria for evaluation	
	5.3	Weighing/prioritizing between different assessment criteria	
	5.4	Comparing systems	
	5.5	Conditions resembling monopoly situations	Only a few vendors of the requested system type
	5.6	The supplier is not given the opportunity to show their qualities	The customer asks so that the vendor does not get the opportunity to show their competitive assets
6. Contract issues	6.1	Complexity, few complete contracts	Difficult to calculate the cost of all items specified in the contract
	6.2	Lack of use of the government’s standard contracts	
	6.3	The government’s standard contracts	These differ from traditional contract regulations (rules, laws)
	6.4	Unclear contract, differing understanding of contracts	Unclear if certain issues are included in a contract
	6.5	Contracts with duration over several years	Discounts included in longer contracts
	6.6	Frame agreements	Frame agreements that ensure flexibility or that have price mechanisms which are beneficial over

			time
	6.7	Contractual access to upgrades	
	6.8	Conditions	Vendor makes reservations concerning the conditions
	6.9	Unsatisfactory delivery	Unsatisfactory delivery compared to what has been specified in the contract
7. Cooperation be-tween municipalities	7.1	Municipal cooperation is challenging	
	7.2	Time-consuming, many stakeholders	
	7.3	Shared operations and "sector-specific systems"	This is often a condition for cooperation, but may require that all announce tenders at the same time
	7.4	Standardization of shared requirements	
	7.5	Need for shared requirement specification	
	7.6	Municipal cooperation affects assessment criteria	
8. Governmental management	8.1	Governmental order/instruction	New instructions without allocated funding
	8.2	Too weak governmental coordination and support	430 municipalities differ in their processes and requirements
9. Process	9.1	Lack of coordination standardization	Lack of coordination and standardization of work processes and systems (many municipalities have the same needs)
	9.2	ICT procurements vs. other procurements	Procurements are delegated to the specific unit, or separated from other procurements
	9.3	Choice of procedure	The regulations specify tenders as the main instrument, but negotiations may be a more suitable procedure
	9.4	Bureaucratic process	Cumbersome for the vendors
	9.5	Time-consuming and complex task	
	9.6	Expensive process	The cost of the process may be very high compared to the cost of the system,
	9.7	Progress plan	Responsibility and the customer's understanding of the progress plan
	9.8	"Keep within the progress plan" and "Too short deadlines for tenders"	
	9.9	Solving needs and problems that arise during the process	
	9.10	Payment schedule	
	9.11	Personnel	Keeping key personnel from quitting
	9.12	Acceptance test	Run within scheduled deadline
	9.13	Follow-up of contract	Both by vendor and customer
	9.14	Management of problems after delivery	Management of problems in the period after the first delivery—the period with contract for maintenance which follows implementation
	9.15	Holistic management	Holistic and overall management from decision of implementation to realized result/change
10. Rules and regulations	10.1	Complex regulations	There may be too much focus on regulations and too little on actual end result
	10.2	The regulations are not followed	
	10.3	Partnership and innovation is prohibited	Possibilities discovered during projects may not be utilized without a new tender. It is also difficult to

			utilize long term relationships
	10.4	Difficult to squeeze out lousy vendors	
	10.5	Tenders may conflict with long-term planning	Change of vendor generates “switching costs”
	10.6	Underutilization of vendor specific assets related to license agreements	
11. Technology and infrastructure	11.1	Consequences of large upgrades	
	11.2	Integration, compatibility	Interfaces to systems already implemented
	11.3	Reuse of components	
	11.4	Strategic choices of technology	
	11.5	Proprietary technologies, lock-in to vendors	
	11.6	Open standardized software and infrastructure	Software and infrastructure based on open standards
	11.7	Rigid systems	
12. Vendor challenges	12.1	Volatile markets (vendors merge or get taken over by others), products are phased out	
	12.2	Vendors oversell	
	12.3	Unsatisfactory/wrong delivery	Extra costs related to this
	12.4	Quality of consultant services	
	12.5	Service attitude with vendors	Lack of service attitude
	12.6	Overcome previous bad experiences, “punish the vendor”	
	12.7	Customers require access to reference customers so they can learn about their experiences	This is time-consuming, and some customers are frequently contacted
13. Governance	13.1	Security	
	13.2	Too much focus on strategy	Consultant fees get high, and fewer resources are left for procurement
	13.3	Lack of strategy	
	13.4	Lack of IT architecture	
	13.5	Requirement of local control	Requirements concerning placement of hardware and use of in-house developed software
	13.6	Lack of control	The customer is not in control of his/her equipment
	13.7	Anchoring	
	13.8	The responsibility dissipates	
	13.9	Too much focus on costs	Too little focus on possible benefits and on quality
	13.10	Lack of willingness to test new solutions	