

E-Procurement as digital collaboration in an integrated coalition limited by EU regulation

Paul Postmes, Marja Exalto-Sijbrands, Pascal Ravesteyn

University of Applied Sciences Utrecht, The Netherlands

paul.postmes@hu.nl

marja.exalto-sijbrands@hu.nl

pascal.ravesteijn@hu.nl

Abstract: Supply chain integration intensifies through digitalisation of business administration (BA) processes. However, it is unclear whether differences exist between the public and private sector in development or implementation of supply chain integration solutions. The large scope of the supply chain, being a large network of companies working together towards one end product, is limited for this study to e-procurement processes. The related software solutions are included. This study starts with a theoretical snapshot of e-procurement. This is followed by a process viewpoint of the e-procurement function. Next five different forms of e-procurement cooperation are presented seen from an actors network viewpoint. The utilisation of these forms create insight in the differences between the public and private sector in their e-procurement adoption behaviour. The process maturity scan results shows that the process maturity between the two sectors is comparable. However, this only explains the differences per sector concerning their ability to improve and control their processes in general. For reliability, this step is followed by three in-depth interviews combined with analyses of recent e-procurement behaviour studies involving the two sectors. The final step compares the maturity outcome with the in-depth data results. Both sectors show certain forms of coalition in the e-procurement. Where 'competition' is a construct that drives the private sector, the public sector has cost control as a driver towards collaboration and integration within e-procurement. This can only partially be explained by the past European financial crises. Differences are found in digital collaboration and the integration itself. The most important difference lies in the European tendering procedure to which the public sector (unlike the private) is restricted. In nature an e-procurement design and development project does not fit the prescribed procedures.

Keywords: e-procurement, collaboration, B2G, flexibility, Actors Network Theory, European tendering

1. Introduction

According to the workshop '*Designing for digital*', held June 2017 in Malta by the EU, digital transformation is "the increasing adoption of digital tools and technologies by an organisation, to fundamentally alter both, its internal and external processes and functions" (Bonnet, 2011). This concerns the transformation of companies and their supply chain partners towards a digital integrated solution. Consequently, the human and machine interface are placed into a new context (Anon., 2016). In The Netherlands digital transformation has become a trend and the pace of embracing digital technologies relates partly to the velocity in which the national labour force is aging (CBS, 2017) and to the education standards (Ooijen, 2015). An extra dimension is the fact that technical maturity of IT systems, internet and telecommunications have reached high levels in The Netherlands (Delen, 2016). This study focusses on procurement management which seems to develop differently between the public and the private sector.

1.1. Motivation

In general the cost for procurement presents 50% to 70% of the revenue value of a company. This can even be up to 80% when it concerns trade companies (Beldad, 2015). This outcome drives companies to focus on procurement process efficiency, and cost reductions to improve their competitive advantage. *Specification*, *Selection*, and *Contracting* are the procurement functions, that present major savings potential once digitalized. Centobelli et al. (2014) mentions an average cost reduction of eight to twelve percent for companies adopting e-procurement technology. Besides cost, the product life-cycle needs to increase, creating closed economies with re-use of waste materials. Today the required sustainability and circular economy are part of legislation, resulting in listing preferred suppliers (Huisman, 2015). The public sector selects suppliers based on their sustainability agenda. Only these suppliers are qualified to enter a long-list – short-list bid-procedure, to be able to participate in governmental orders.

Beating competition, the European blanket-order tender procedure swallows supplier's budget long before the service is delivered. Municipalities outsource 62% of their policy based research (Bakker, 2014). Also below the blanket-order threshold municipalities are inefficient in their tendering process by inviting too many research institutes for a low-budget project e.g. 20k. The consequence is experiencing too much selection effort. Too

much time spent annually on acquiring these type of tenders ends in negative results for both the buyer and the supplier (Volker, 2008). With all regulationⁱ, tenders of municipalities have become less attractive according to the association for policy research in The Netherlands (Rienstra, 2012).

Processing European ICT tenders, governmental institutes have to deploy seven criteria, which are: 1) The size and nature of similar projects; 2) The organization of the agency; 3) The implementation capacity in relation to the project; 4) The motivation for and vision of the implementation of the project; 5) The reputation of the agency; 6) The previous experience with the agency; 7) Memberships and certification (of the Association of Policy Research, of a network and ISO standardization) (Delen, 2016). A study performed in 2007 and 2011 shows certain shifts in importance of these criteria. 'Size and nature of similar projects performed' dropped from 21% in 2007 to 12% in 2011. The importance of the criterion 'previous experiences with the agency' increased with 20%. In 2011 apparently 'existing contacts' was valued higher than 'comparable experience'. Also, the criteria 'the independence of the agency' and 'the usability for the client' grew in importance. 'Presence of a quality system at the agency' does not seem to have value during the selection process. The criteria of the 2011 study are behavioral criteria and may be of importance to this study.

1.2 Scope of this study

In The Netherlands the public sector entails national and local government, academic medical-care institutes, education, and institutes in relation to waterways, roads and infrastructure. To narrow down the 'public sector' for this study, the focus lies on the national and local governmental bodies, such as municipalities. Although per type of public institute the procurement process differs due to legislationⁱⁱ, the national and local government, both share a common procurement approach. Therefore, from here on the Public Sector refers to national and local governmental institutes. The environment in which the private and public sectors are studied is the business to government (B2G) (Cauter, 2014).

In The Netherlands e-procurement in the private sector has taken a flight, with a relative high density of web-shops and online sales solutions compared to other countries (Beldad, 2015). Solutions found, run from e-catalogues, up to e-sourcing initiatives and vary amongst organisations, depending on their size and education level (Costa, 2013). This study focusses on e-procurement solutions, adopted by the public sector. In particular the outsourcing of ICT services is the type of procurement studied for this paper. The supply chain management focus requires to study both: the sell and buy side of these outsourcing services. Fitting the Malta definition this research follows the supply chain perspective, whilst studying digital transformation of the procurement process.

1.3 The purpose of this paper

To understand the expected differences between the public and private sector in outsourcing ICT services, a longitudinal research project is planned. Prior to launching this research, an unambiguously starting point needs to be defined. The purpose of this paper is to set this starting point and to find dimensions and constructs effecting the digitalization of procurement of the public sector. With these a longitudinal research project can start to determine the type and weight of the effect of the dimensions and constructs found. With this insight, digitalisation of procurement must become feasible at a large scale in the public sector. To conclude, this paper's result is dimensions and their constructs found, affecting the development of e-procurement within the B2G environment. Therefore the main question for this descriptive research is:

Which constructs in the B2G business environment affect a joint efficient and effective e-procurement process, supporting individual company objectives?

1.4 Structure of this paper

After the research approach (chapter two), a literature review is performed to find dimensions and criteria of importance for e-procurement (chapter three). Results from analysis of theory and additional data collected are found in (chapter four). Chapter five follows with conclusions and discussions. This paper ends with limitations, and suggestions for the planned longitudinal research project (chapter six).

2. Research approach

This predominantly qualitative research follows 4 steps. Firstly, an in-depth literature review delivered a theoretical framework defining dimensions and constructs that can be compared with practice. English and Dutch language literature searches delivered: concepts of procurement, information about procurement means, cooperation concepts, a process maturity approach and innovative technical developments. Keywords used in

the search process were: e-procurement, procurement process, process requirements and constraints, governmental institutes, collaboration, B2G, predictability, decision making, IT outsourcing and supply chain management. Over the period 1996 to 2017, scientific sources selected were: academic journals, university reports, conference papers and governmental publications. The same time period and keywords were subject to searching secondary sources e.g. reports from public services, branch organisations in the (e-)procurement, websites of e-procurement suppliers, and governmental institutes in The Netherlands. The total literature search resulted in 36 usable references out of 117 documents.

Secondly, additional constructs were found within the process maturity dimension of prior research on Business Process Management Maturity (hence BPMM). Generic BPMM is studied at HU Netherlands' research centre 'Process Innovation and Information Systems', via a longitudinal quantitative research project. Both, the public and private sector participate by answering a validated questionnaire, build on a Likert scale. The 2016 database results with 126 responses was made accessible.

Thirdly, practice was studied via in-depth interviews on the procurement process. The interview topic-list entailed the dimensions found via both the literature study, and the BPMM research. Additional micro- and macro-economic trends were added. The topic-list and interview questions were discussed within the research team, and subsequently altered where needed. After a test interview, three semi structured interviews were held from June to November 2017. The first interviewee, a managing partner from a consultancy firm, and specialised in ICT-tooling for (e-)procurement for the public sector resulted in useable examples of multiple procurement projects. His input led to acknowledgement, nuance, and in-depth insight on the matter. The second interviewee (a public sector senior 'buyer' practitioner at a large education institute) was able to confirm, reject or nuance the literature and practice analyses findings and results on procurement. The third interviewee (a supplier of IT solutions for the national government) was chosen by recommendation of the second interviewee. The findings from all three interviews were compared with other sources such as that of Weele (2003) and Bakker (2014) for further comparison, confirmation or adjustment.

Finally, an additional study based on secondary literature and case studies was performed to check the results on dimensions and constructs found at the first three steps. All outcome found by field results and additional desk research was analysed and mutually compared to achieve triangulation. All data gathering and analyses is performed by two researchers. All results were checked by all three co-working authors.

3. Theoretic Framework

To find dimensions and constructs for the purpose of the longitudinal research, a literature review with focus on e-procurement and its process performance, is performed from which the theoretical framework is developed as presented in the last paragraph.

3.1 e-Procurement

The terms 'purchase' and 'procurement' are often used interchangeably. Procurement is seen as the overarching process to which purchase belongs (Westerski, 2015). This makes Procurement a set of processes related to acquisition of goods and services, through purchase-orders. Procurement has therefore a wider reach in digitalization than purchase has. In 1994 at procurement level, the first adoption of technology was found in the definition by Weele (2003) and concerned Electronic Data Interchange. In 1996, Telgen categorized the e-procurement process into: e-transacting and e-informing processes. From 2002 onwards internet entered the definition as technical solution for the procurement process (Schotanus, 2008). Schotanus (2008) labeled e-informing as 'purchasing intelligence' with 'e-contract management'. According Weele (2003) e-transacting entails: e-sourcing, e-tendering, e-reverse auctioning, e-ordering, e-invoicing, web-based ERP and procurement-to-pay. Whilst the e-informing processes exist due to strategies, the transacting processes can be operational or tactically focused (Weele, 2016). With the availability of web-based solutions, e-procurement has become subject of strategic supply chain and integration solutions. The internet offers a variety of models and tools for e-procurement (Weele, 2003), which formed the foundation for e-marketplaces within the B2B environment (Balocco and Rangone, 2002). The definition of e-procurement that is used in this study is 'the use of Internet Technology (IT) in the process of providing goods and services' (Weele, 2016).

Previously, (Monczka, 2005) analysed the functional value of 'procurement management' in order to determine the performance and competitive position of an organization. Kenjale and Phatak (2002) highlighted how the exchange within B2B can create value chains that reduce costs for both, the buyer and the supplier, and how

internet tools better align the supply chain to customer needs. Eakin (2003) indicates that the procurement process needs to be measurable in practice to be compared and analysed. Process maturity gives insight in the maturity of the process measurements. BPMM is defined as process oriented design and analysis of the organization, supported by information systems in order to enable an organization to increase their grip on processes (Ravesteyn et al., 2012). The definition of Ravesteyn matches both, process maturity and performance. The required performance indicators involved may be complex due to the multi-actor involvement. Using the same questionnaire Exalto-Sijbrands et al. (2016) find value in using BPMM within the supply chain as a *communication tool*, influencing behaviour (Exalto-Sijbrands, 2016).

3.2 Constructs on e-procurement performance

In general the ‘commercial’ aspect of procurement at municipalities concerns: e-sourcing, e-tendering, e-auctions for special negotiations, e-contracting and finally e-invoicing. Being part of a network implies that all parties influence the network and each actor brings in environmental aspects (Vriend, 2016a). Also ‘Information’ and ‘finance’ influence the procurement decision (Minnema, 2017). The construct ‘being successful’ appears to be a perception with *re-contracting* as result. This requires measurement of defined transaction indicators such as cost, flexibility and shared values (Faber, 2007). According to Delen (2016) ‘success’ depends mainly on three statistically significant controllable factors: (1) working according to the transition plan, (2) demand management, and (3) communication within the supplier organisation opposed to communication between buyer and supplier. Besides the ‘perception’ about the transaction between the actors, ‘emphatics’ is seen as an important aspect in order to control perception among actors (Minnema, 2017). Finally, one of the most important criteria is ‘cross-sectoral supply chain networking’, which is focused on multiple value creation. This increases the economic value of all actors involved and their ecological and social value such as emphatics (Erakovich, 2013).

3.3 Conceptual model

B2B e-market-places exist due to internet technology, moving from human-to-human (H2H) to machine-to-machine (M2M) interfaces in the near future (Vriend, 2016b; Anon, 2016), and making *Technology* the first dimension. E-Procurement addresses e.g. e-catalog, e-procurement, e-contracting and e-transaction, which addresses *e-tools* as important construct. Processes require performance indicators to be able manage results in the required direction. This makes *Process* the second dimension with *Maturity* as its construct. Organizations involved in procurement are part of a multiple-tier situation within the evolved supply chain. Getting collaborative value for all actors involved, is a prerequisite when developing ecological and social value, next to *Cost* and flexibility as third dimension. The human factor presenting *Behavior* as fourth dimension, shows differences at process level between generic and European blanket-order tenders. With European blanket-order tendering as subject to this research, also *Regulation, law and politics* are required as dimension. Summarized the dimensions are: *Technology, Process, Cost, Behavior and Regulation* (see Figure 1) with the underlying constructs found in the literature as presented.

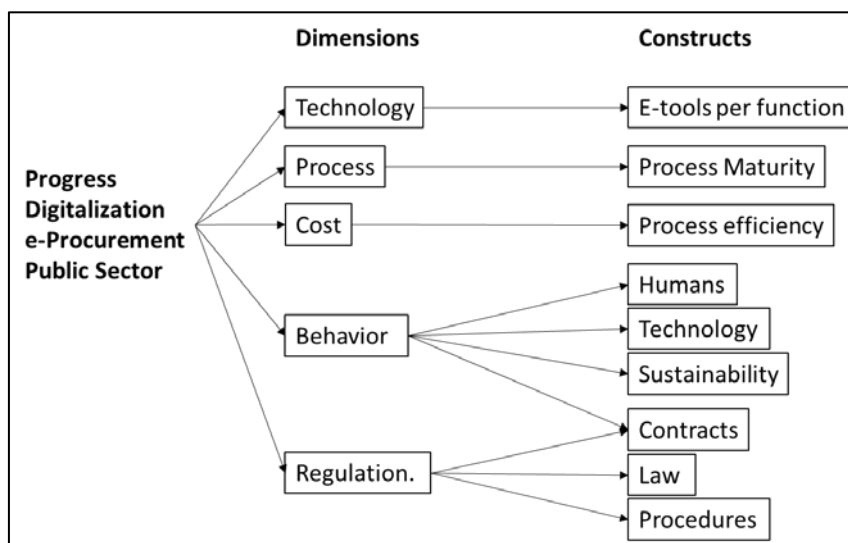


Figure 1 Dimensions and Constructs found in literature

3.4 Methods used

With human and technical factors as reasons for behavioral actions (Latour, 2005; Williams, 2002) the Actor Network Theory (ANT) adds sociotechnical change and policy implications to this study (Dankert, 2015; Fenwick, 2012). Subsequently, constructs of *Behavior* selected from literature for the interviews, are: humans, technology, sustainability, and contracts. The three interviewees had options to additional factors during their interview.

To understand the different cooperation options within e-procurement, the Highway Matrix Model is used that distinguishes five cooperation categories (Vliet, 2004). The 'frequency' and 'intensiveness' of cooperation form the axes (see Figure 1). This model presents for each category of cooperation: the pros and cons, the appropriate products and services, the critical success factors and other characteristics e.g. human behavior. The first form is '**PiggyBack**', that describes high volume contracts, negotiated by one large organization from which small organization benefit for a small fee. The second is '**Greyhound**' which presents a procurement-agency, that continuously closes procurement contracts, based on its own procurement vision and policy. This is seen as Procurement As A Service (PaaS). The third form called '**Carpooling**' shows a number of organizations, that jointly perform their procurement needs. '**Convoy**' as fourth form is a very intensive form of cooperation that requires a serious investment in time and seeks economies of scale with substantial cost savings for a once off solution. '**Formula 1**' as fifth and rarely occurring form, is the most intensive cooperation form, based on joint procurement requirements.

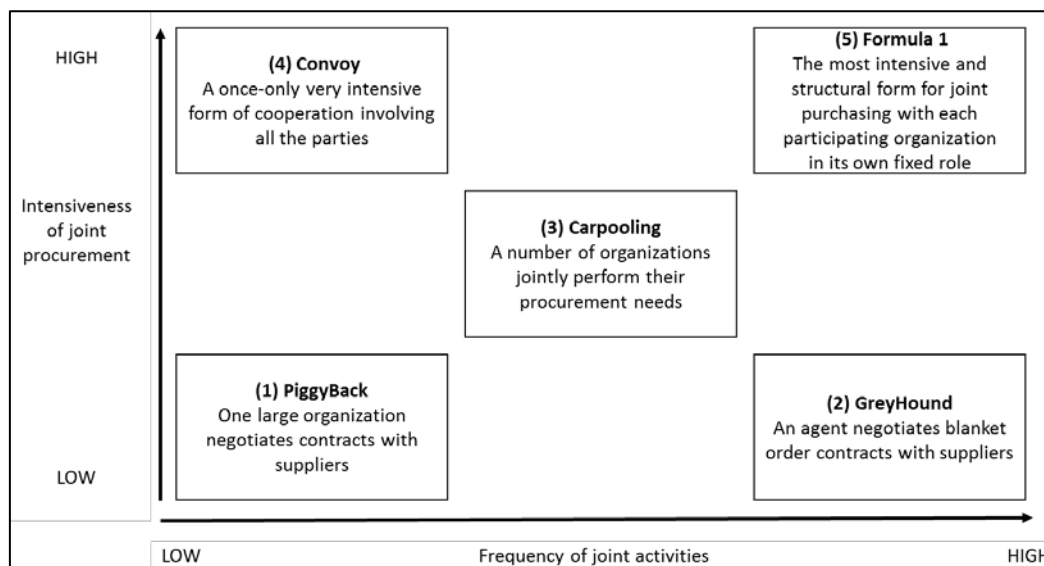


Figure 2 Frequency and intensiveness of cooperation at Highway Matrix purchase and procurement.

4. Results

The results are presented based on the selected dimensions.

Behaviour, Technology and Cost

Municipalities have found efficiency in 'Combined tendering' for certain needs. With new ICT requirements set by new policies, all municipalities in need of a prescribed standard solutions find synergy in creating one joint procurement organization for just the one tender. Sharing the burden and getting a better price is becoming a strategy. Although, this has only been found as case descriptions. Aging of the population and cost reasons may be influencing constructs behind this new procurement process approach.

Process and Regulation

Over the past two decades the tender procedure in general has been influenced by the growing importance of social entrepreneurship and good governance (Bakker, 2014). Sustainability regulations and transparency of (procurement) procedures towards the (local) population (Ooijen, 2015) have grown in importance. Examples are the adoption of 'Obtained sustainability certificates', and 'The reflection of the countries' cultural diversity at the supplier's workforce'. Without these, suppliers cannot register as potential B2G-supplier. Additionally the tendering procedure is strict and follows guidelines and regulation.

4.1 Process maturity

The private sector's competitiveness pushed process control and flexibility at organizations to higher levels. The highest maturity level a company's process can reach is '5', being fully mature with high flexibility and total process control. Over 2016, the average maturity score of companies at The Netherlands was 2,8 (Exalto-Sijbrands, 2016). The 54 public sector companies scored 2,5 and the 72 private sector companies scored a 2,9 for their average process maturity. A T-test that was conducted to determine significance in the difference between the sectors, resulted negative. No significant differences between the two sectors were found on the factors. The average scores of both sectors are presented in Table 1 with the conclusion that the public sector only falls slightly behind the private sector. The maturity dimensions *Description*, *Measurement* and *Knowledge & Improvement* show the largest gap. Being a company average over all processes, these Netherlands maturity scores do not discriminate in type of process e.g. the procurement process. Therefore, the results found are indicative for the procurement process. However, based on the results it can be assumed, that procurement processes are often less consistently measured, and IT support falls short. Furthermore, the public sector processes are expected to be less transparent (description), and knowledge to improve is less well organized.

Average scores Process	View		
	Private sector	Public sector	Netherlands total
<i>Awareness</i>	2,92	2,66	2,87
<i>Description</i>	3,25	2,80	3,12
<i>Measurement</i>	2,83	2,40	2,69
<i>Management</i>	2,89	2,51	2,80
<i>Knowledge& improvement</i>	2,94	2,51	2,82
<i>IT/means</i>	2,57	2,27	2,47
<i>Average total</i>	2,9	2,5	2,8

Table 1 values of the underlying constructs influencing process maturity

4.2 Interview results

The questions posed during the interviews focussed on understanding procurement within municipalities from the perspective of the dimensions of our conceptual model: *Technology*, *Process*, *Cost*, *Behavior* and *Regulation*.

Behaviour related to Process

All three interviews explained that the tendering part of the procurement process resulted in certain 'system-human' behaviour at the public sector. Three types of service requests of the public sector were found: Source to Settle (from strategic to tactical contracting of suppliers); Source to Pay (the contract and financial transaction); and End-to-end procurement automation (digitalisation of all operational aspects of procurement). All three types require customisation of the supporting systems. A comparison with solutions at the private sector still needs to be performed. Additionally all three interviews pointed out that 'Formlue 1' is the most wanted solution and an upcoming trend among municipalities for jointly tendering on standard ICT solutions.

Technology, Regulation and Behaviour

The first two interviews show, that the European tendering process itself blocks software design projects. The blanked-order tendering process only works with 'exact defined result'. Within a software development project, where digitalization options need to be creatively found, designed, tested and further developed, the exact outcomes cannot be predefined as the European tendering regulation prescribes. The public sector has different process requirements in comparison to the private sector. These requirements for the development of the e-procurement software tool itself must be part of the project. Municipalities are not equipped to perform this themselves. In 2009 the Government Building Service, the Government water system control and the Ministry of Defence developed an additional step prior to the European tendering process itself: 'The Competitive Dialogue'. This solution offers the tender shareholders a communication step in which the required (design) results can be defined more precisely and through brainstorm, if required. Then, based on the outcome, the tendering starts among all shareholders. However, 'The Competitive Dialogue' is not the solution for a true software design and development project with a non-predetermined outcome. These activities need to be part of the solution development project itself.

5. Conclusions and discussion

The question 'Which constructs in the B2G business environment affect a joint efficient and effective e-procurement process, supporting individual company objectives?' can be answered by: *With slightly less ICT and process knowledgeable employees, and a restricted adoption of e-procurement, limited to the standard available solutions, the option for cost reductions at e-procurement is confined for the public sector.*

Constructs of Technology, Cost and Behaviour

In nature detailed design and development results of customised digitalised e-procurement solutions cannot be predefined at the start of the project. Unfortunately Municipalities, will have to be able to, due to the European blanket-order tendering procedures. This limits municipalities in their customised e-procurement solutions development options. As result they utilise standard ICT-solutions. It also affects their cost reduction opportunities. For certain purchase needs, and driven by cost and the aging labour market, municipalities seek to work jointly in a *Convooy* solution. Whilst their e.g. Australian counter parts are able to develop e-procurement at all advantages as required (Hardy, 2008).

Constructs of Process, Behaviour, Cost and Regulation

The tender placed in a 'Municipality customized e-procurement workflow' will demand certain decisions that currently depend on human behaviour. A newly designed e-procurement system will also alter the procurement behaviour in selection of consultancy organisations. This leaves management of the municipalities in a catch 22 situation. Where behaviour adjustment is needed at procurement, the tendering procedure prevents customised e-procurement development. Therefore assets and efforts will continue to be wasted of municipality as well of that of the listed consultancy organisations (<https://www.tenderned.nl/tenderned>, 2017). The effect this has on behaviour and cost, will need to be made explicit by the additional research. The in 2009 added 'Competitive dialogue' to the EU-tendering regulation does not solve the problem found and therefore new additional EU tendering rules are required to help the public sector develop e-procurement that is comparable with the private sector.

Discussion

Clearly the option for digitalization is limited compared to non-European municipalities. With a less 'digitalised e-procurement process' the interaction between shareholders misses the required optimisation. What is most important is: *Municipalities are restricted by EU regulation in designing customised cost reduction systems.* This study on e-procurement must therefore also be extended to the cost reduction implications.

From a process maturity viewpoint the low level of ICT tools-adaption at Municipalities can also be explained by the EU tendering regulation. However with the factor 'process knowledge' showing a wider gap with the private sector, then the ICT factor does, additional research is needed. The trend this study found is *adoption of in-house solutions to lower purchase cost.* In 2007 the public sector started with insourced hardware and software contracts. From 2014 onwards 22.000 desktops have moved to insourced contracts, resulting in 50 mil euro's cost reduction in 2012 (Blankena, 2012). The cost effect of the tendering regulation, does affect the procurement cost which rectifies the cost dimensions chosen for this study. It does not explain the low 'process knowledge' factor. Factors responsible must be found and added during the longitudinal study.

6. Limitations

Comparing the literature outcome, desk research on former studies, and the results of the BPMM with only three interviews is conceived as limited. Therefore, the outcome of this study is seen as indicative for setting the dimensions and underlying constructs. Additional study is required to improve validity and reliability of the outcome of this study.

In this study, the maturity-level of e-procurement processes were assumed to be comparable with maturity-levels of general processes (as an average of all processes at participating organisations). Process maturity research on e-procurement at the public and private sector will be explicitly addressed within the planned longitudinal research.

The scope set for this study, limits the direction where dimensions and criteria can be found. Further research must prove whether this is right or needs to be adjusted.

End Note:

- ii Both, National and Local Government need to apply to what is called: GIBIT, which stands for 'municipality purchase conditions on IT'. The conditions to apply to are determined by the KING-institute (the Quality institute municipalities of The Netherlands) prescribing the quality and European Tendering rules (Volker, 2008).
- ii European Commission, Executive Agency for Small and Medium-sized Enterprises (EASME), as part of the DIGIFRAME project with the goal to develop an 'integrated digital organisational reference framework to strengthen capabilities to digitally transform businesses'.

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