ABSTRACT

Purpose
The study investigates whether and how public procurement drives innovation, extending the notion of innovation to the supply chain and to the cascading of innovation throughout the supply chain.

Design/methodology/approach
For this embedded case study, relevant legislation was reviewed and data were collected using semi-structured interviews with key informants from the selected sectors.

Findings
In this work, factors affecting public procurement for innovation in two sectors in Finland, healthcare and energy, are identified. Using this information, supply chain management principles and information from revised EU directives on public procurement, insights into how innovation can be cascaded in a supply network are provided.

Research limitations/implications
The findings are based on the initial part of an ongoing longitudinal study, but limited since not all data points identified through the snowballing sampling were yet interviewed.

Practical implications
Identification of factors can aid policy-makers, procurers and suppliers in understanding the link between public procurement and innovation.

Social implications
The study raises awareness of the interlinkages in health and energy sectors between procurement processes and supply chains, and what actions organisations can take to promote innovative solutions, supporting smart, sustainable and inclusive growth.

Original/value
The study provides practitioners, policy-makers and researchers with insights on the issue of combining innovation and procurement.

Keywords: Public procurement, innovation, supply chain, public contracts regulation
1. BACKGROUND

Organisations involved with public procurement are subject to rules and regulations they are expected to adhere to (TEM, 2016). In April 2016, European Union (EU) member states are expected to have adopted the reformed public procurement legislation. The new legislation (European Commission, 2016), while taking into account changing economic circumstances and budget limitations, is aimed at simplifying and making more efficient the public procurement process for both suppliers and procurers. Under the reformed legislation, special attention has been paid to small- to medium-sized enterprises; total life cycle costs, competitive dialogue, innovation partnerships and cross-border joint procurement. Public authorities in Finland spend about 22.5 billion euro annually, about 15% of GDP on procuring public goods, services and works (Hankinnat.fi, 2016). Considering the size of the public purse, the EU identified public procurement for innovation (PPI) as an instrument that is a policy objective in itself and that can also be used to meet other policy objectives such as security of supply, sustainability, competitiveness and job creation.

According to Ellram and Cooper (1990), in SCM the supply network is a single body, not a set of separate elements, each of which performs its own function. Therefore, it can be concluded that actions in the first tier supplier-procurer relationship can affect activities in, or “cascade” to, other organisations in the supply chain. Organisations that are interconnected can affect the performance of each other’s activities, e.g. in sales and research (Johnsen, Wynstra, Zheng, Harland, & Lamming, 2000). Forrester (1958, p. 37) in writing on what is now thought of as supply chain management (SCM), identified how organisational success was dependent on “interactions between flows of information, materials, money, manpower and capital equipment”. Forrester went further to argue that there was an advantage for organisations that realised the “interrelationships between separate company functions and between the company and its markets, its industry and the national economy”.

In this paper, we take the position that to successfully and effectively cascade innovation in a supply network, it is necessary for the linked organisations to apply some common principles. In the literature on supply chain management (SCM), favourable outcomes for a supply network have been attributed to reciprocal sharing of information (Ellram & Cooper, 1990; Spekman, Kamauff Jr, & Myhr, 1998; Tyndall, Gopal, Partsch, & Kamauff, 1998); sharing of risks and rewards (Cooper, Ellram, Gardner, & Hanks, 1997; Cooper, Lambert, & Pagh, 1997); supply network cooperation (Ellram & Cooper, 1990; Tyndall et al., 1998); process harmonisation (Cooper et al., 1997; Tyndall et al., 1998); incorporation of suppliers and customers in the supply network (Frohlich & Westbrook, 2001); long term relationships between supply network members (Spekman et al., 1998); and lastly having the unified aim of serving the customer or end-user (Beamon, 1999).

The SCM literature is short on information dealing with public procurement for innovation and cascading innovation in a supply network1. What literature exists is on adoption of innovative technologies by individual firms, see e.g. (Grawe, 2009; Patterson, Grimm, & Corsi, 2004; Sheffi, 2004). Therefore, the authors looked at literature from other, sometimes related, disciplines that we consider will generalise to cascading innovation in a supply network through PPI.

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1 In this paper, the authors consider the supply chain to be a supply network and use the terms interchangeably. Supply chain implies a linear relationship while supply network illustrates the connections and relationships of myriad interacting entities, see e.g. (Cox, Sanderson, & Watson, 2001)
1.1. Public procurement

Public procurement refers to the process by which public authorities, e.g. government departments or local authorities, purchase goods, services or public works from companies (TEM, 2016). This purchasing of goods and services funded by the taxpayer has led to public procurement being more regulated, for example when compared to private procurement (Henriksen & Mahnke, 2005). Furthermore, Leenders and Fearon (2008) state that public procurement has historically placed emphasis on price and quality of the procured goods and services as well as on the rigor of the procurement process itself. The way a supply network functions can be influenced by policy, legislation or regulation (Franks, 2000). In Europe, public procurement is regulated at the national and EU levels. The EU’s “classic directive” (2004/18/EC) and “sector directive” (2004/17/EC on public procurement in the utilities (i.e. water, energy, transport and postal services)), have been incorporated into Finnish legislation. The legislation outlines different procedures such as the open procedure where contracting authorities publish a contract notice and all interested suppliers may submit a tender; the restricted procedure where suppliers must request, and be invited, to participate; and the negotiated procedure where any supplier may request participation and the contracting authority then negotiates the terms of the contract with the selected supplier.

In April 2016, member states are expected to adopt reformed EU public procurement directives (2014/24/EU and 2014/25/EU) which specifically speak to the ways in which public procurement can maintain its high standard and still enable innovation. The new EU directives contain adjustments to the previous procurement legislation in terms of i.a. documentation required and existing procedures, but they also introduce new practices, such as innovation partnerships, aiming to develop an innovative product, service or works and to allow the authority to subsequently purchase the resulting supplies, services or works. Lastly, the new directives no longer specifically mention lowest price as a contract award criterion. The European Commission (2016) asserts that the revised regulations are to encourage flexibility and competition, at the same time boosting innovation and value for money in procured goods, services and works.

1.2. Why innovate?

According to Pasmore (1994), Hamel and Välikangas (2003) and Franks (2000), being innovative or employing innovative processes are some of the ways organisations can prepare for change or bring about change. Organisations also adopt innovations in order to achieve higher service levels (Prahalad & Mashelkar, 2010). However, the act of adopting innovation is on its own insufficient, it is more effective when it is used and also adds value to partner firms in a supply network (Kim, 2000).

For the purposes of this paper, innovation is seen as the "implementation of a new or significantly improved product, service or process, including but not limited to production, building or construction processes, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations" (Art. 2 (22) in 2014/24/EU, and Art. 2 (18) in 2014/25/EU).

Public procurement for innovation, PPI, can be characterised as "buying goods and services in a way that stimulates the supply chain to invest in developing better and more innovative solutions to meet the unmet needs of an organisation" (Hérnandez Garvayo, 2013). PPI can drive economic growth, better public service performance, adapt to the changing needs of public service users, minimise public spending and boost service efficiency (Tekes, 2016). Other reasons put forward in support of PPI include that authorities can act as lead markets for
new technologies (Czarnitzki, Ebersberger, & Fier, 2007). In addition, the economies of scale in public sector procurement of a single procurer or through bundling can be the stimulus required for manufacturers or providers to innovate as there is a ready market (Edler & Georghiou, 2007). Barriers to adoption of innovation include the risk aversion present in public sector procurement (Edler et al., 2005).

Additionally, some authors on PPI, see e.g. (Borrás & Edquist, 2013; Edler & Georghiou, 2007; Edquist, Hommen, & Tsipouri, 2000; Erridge & Greer, 2002; Tödtling & Tripl, 2005), have documented that innovation can be stimulated from both the demand and supply side: on the supply side, a core tool is funding for R&D and training as well as tax incentives for corporations, while on the demand side, stimulation for innovation can come from policy, regulation or public procurement. As pointed out earlier, organisations in a supply network have interdependencies; it follows that public procurement triggering innovation in one supplier organisation can precipitate or cascade innovation in other organisations not directly connected to the procurer (Kaafarani & Stevenson, 2011; Vonortas & Spivack, 2006).

1.3. Purpose

In this paper we aim to develop an understanding of whether and how public procurement drives innovation, extending the notion of innovation to the supply network and to the cascading, i.e. domino effects, of innovation in the supply chain. Using information from key informants, coupled with SCM principles and revised EU public procurement regulations, we seek to answer:

a) What are the factors within which public procurement processes should function to comply with public procurement legislation while fostering innovation in the supply chain?
b) How can procurement processes lead to cascading innovation?

This is the first study in Finland that deliberately targets particular sectors, health care and energy, and investigates the factors for fostering cascading innovation through public procurement. This work deals with propagating innovation in a supply network. The subject of how organisations innovate, while connected, is beyond the scope of this paper. The interested reader is directed to e.g. (O’Brien & Smith, 1995; Webster, 2004), for work on how organisations innovate.

The rest of this paper is laid out as follows: we describe the sample set and outline the methods used in gathering and analysing data. This is followed by an illustration, based on respondents’ descriptions of supply chains in the case sectors; there after we present finding from interview data highlighting factors that affect PPI. We then contrast the current PPI situation with how it can be made more effective and end with conclusions, limitations and suggestions for future work.

2. METHOD

According to Kirk and Miller (1986, p. 9), qualitative research can be described as “a particular tradition in social science that fundamentally depends on watching people in their own territory and interacting with them in their own language, on their own terms”. Marshall (1996) goes on to say that a goal of qualitative enquiry is to “provide illumination and understanding of complex psychosocial issues and are most useful for answering humanistic why? or how? questions”.
This study was carried out using an embedded case study approach. The embedded case study method allows for the inclusion and comparison of more than one unit of analysis, and is particularly suitable for complex and contextualised objects of research (Scholz and Tietje, 2002).

An embedded case study involves multiple subunits of analysis (Yin, 2003). In this research the unit of analysis was the activity of public procurement, with the healthcare and energy sectors in Finland as subunits of analysis, i.e. the case is defined as the procurement activity in the public context, being informed by regulation and practices, while the sectors are subunits of analysis in which the activity takes place, but is also influenced by sector-specific factors. This study is further concerned with how innovation can be cascaded in a supply network, where the network is made up of multiple organisations. Marshall (1996) advised that the research question should guide the choice or research method. For data gathering, the units of observation were the organisations within the sector. Data were collected from the units of observation through the use of semi-structured interviews with key informants from the organisations forming the sectors included in the study. The key informants were arrived at through snowball sampling; the starting point of the “snowball” was a Finland's National Emergency Supply Agency (NESA) professional with expertise in each of the sectors of interest. Each interview subject was then asked to suggest who they thought would be able to provide information based on the topic under investigation.

From healthcare, key informants were procurement professionals, medical doctors, infectious disease specialists, sales persons, pharmacists, engineers (medical devices), quality assurance managers, product specialists and lawyers. In energy, key informants also had varied roles; analysts, procurers, logistics managers, sales persons, construction managers, lawyers, risk officers, scientists, business continuity managers, project advisors, strategists and technology officers. Importantly, each key informant had knowledge or was involved in public procurement, innovation and law, all of which are components of this study. Furthermore, through the roles the key informants had in their organisations, they interacted with key informants from the other organisations in the study at different points in the supply network. Table 2.1 shows a breakdown of the type of organisation, by sector, sampled for this study.

With the permission of the interviewees, the interviews were recorded. Apart from the interviews being recorded, the interviewers also took notes and made observations. The interviews included in the study took place between May 2015 and February 2016. The authors listened to the audio recording of each interview several times and in some cases did the transcription from speech to text. The transcripts were also read several times. Research validity was achieved by reaching consensus among the coders on the interpretation of the text. After reaching agreement, the data were coded, manually to start with, into themes and sub themes. The themes and sub-themes were formed from patterns in the data identified by the authors. The themes and sub themes were then transferred to NVivo, the qualitative analysis software tool. Other information used in the coding came from the field notes taken and observations made during interviews.
Table 2.1 Descriptive characteristics for each sector and its key informants

<table>
<thead>
<tr>
<th>Sector</th>
<th># of interviews</th>
<th>Description of organisations in case sectors</th>
<th>Description of key informant roles in organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>Twenty-two</td>
<td>Industry federation, government departments, quasi-government departments, supplier organisations (device and pharmaceuticals), hospitals</td>
<td>Procurement professionals, medical doctors, infectious disease specialists, sales persons, pharmacists, engineers (medical devices), quality assurance managers, product specialists and lawyers</td>
</tr>
<tr>
<td>Energy</td>
<td>Fourteen</td>
<td>Industry federation, government departments, quasi-government departments, producers, supplier organisations</td>
<td>Analysts, procurers, logistics managers, sales persons, construction managers, lawyers, risk officers, scientists, business continuity managers, project advisors, strategists and technology officers</td>
</tr>
</tbody>
</table>

In the analysis of Sandelowski (1995) and Patton (1995), all sampling in qualitative research falls under the broad umbrella of purposeful sampling. Morse (1991, p. 129) however, describes purposeful sampling as one of four types and is used when “the researcher selects a participant according to the needs of the study”. A shared principle in all three bodies of work, is that the cases are purposefully selected to suit the study. Morse (1991) goes on to state that researchers employing purposeful sampling elect to “interview informants with a broad general knowledge of the topic or those who have undergone the experience.”

The sectors in this study were purposefully sampled, in consultation with experts from NESA and the HUMLOG Institute from the HANKEN School of Economics. NESA (2016) maintains a list of sectors that it considers critical and which should function even when there is a crisis. Energy and healthcare are two sectors NESA considers critical in relation to security of supply, and the organisations within these sectors represent different echelons of the supply network in these sectors. NESA continually reviews the preparedness of its critical sectors and this study is part of that review. A characteristics considered in sector selection was that the sectors should be crucial to the wellbeing of Finnish society. In the same vein, healthcare and energy were identified as having higher risks of potential disruption. Lastly, another consideration was that innovation in a sector’s supply chain was likely to have an impact on other sectors, e.g. innovation in the energy sector can have an impact on the agro-tech sector by way of biofuels.

3. **SUPPLY CHAINS IN THE HEALTH AND ENERGY SECTORS IN FINLAND**

Based on information from interviewees, in this section we chart the primary supply network members in the healthcare and energy sectors in Finland (Figure 3.1).

Data in the healthcare sector were centred on the supply of physical goods such as pharmaceuticals, vaccines, medical equipment and medical devices. The public procurer unit was typically the hospital district warehouse or pharmacy, supplying end-users (i.e. doctors and nurses) in hospitals and health clinics within the district. Information from respondents
illustrates that the distribution of pharmaceuticals in Finland is dominated by two large wholesalers, while the medical devices and equipment distribution seems more fragmented. The manufacturers of both pharmaceuticals and devices/equipment are mainly multinational or global players, who often have a local representative (e.g. subsidiary or importer) in Finland, but otherwise the production and allocation-decisions of pharmaceuticals and medical devices are taking place outside of Finland (such supply chain members are illustrated in Figure 3.1 with boxes with dotted borders). On the pharmaceutical side, it is to be the local representative who submits tenders in a public procurement procedure.

![Figure 3.1 Healthcare and energy sector supply chains in Finland](image)

In the energy sector, the aspect discussed by most interviewees in relation to PPI was electricity and electrical power, infrastructure and means of consumption. Compared to the health care sector, the first thing to note is that the supply of power is represented as two streams; the electrical power and the means by which it is accessed. Furthermore, it is noticeable that the electrical power over the network is in itself the same, although it might stem from different production methods. The supply of electricity is dependent on the infrastructure, and a buyer cannot procure supply of power without also procuring the transmission and distribution over the power network. There are however different actors involved in both streams; this is an artefact of the deregulation of the European electricity markets a few years ago. In contrast to the health care sector, the electrical power production does take place inside and outside Finland.

Although not illustrated in Figure 3.1, decisions taken by authorities and legislators or policy makers on the national and extranational arena have an impact on the supply chains depicted here. In addition, the health and energy sector supply chains are supported by logistics and information and communication technology that link together the primary supply chain members.
4. FACTORS AFFECTING PUBLIC PROCUREMENT FOR INNOVATION

In this section, we detail some of the factors that emerged from analysis of the interview data as affecting public procurement for innovation. It is worth mentioning that the concept of innovation was not predefined by the interviewers; instead interviewees were asked their views on innovation, public procurement and any linkages between the two. Factors affecting PPI can be broadly categorised into policy and regulation, incentives, proof of concept and trials, risk appetite, cost, tender process requirements, information exchange and market characteristics. Each of these is discussed in more detail in the remainder of this section.

4.1. Policy and regulations

Policy and regulation, relating to public contracts in particular and the two sectors in general, seem to affect how innovation finds its way into and can be fostered by the public procurement process. In the Finnish energy sector, informants pointed to policy and regulation as a factor spurring innovation. Some regulations, such as those pushing for increased use of clean energy, came about as a result of other policy objectives related to climate change. Policy makers would like to utilise public procurement in identifying and using innovative solutions that contribute to the reduction of carbon emissions. This is similar to instances documented in the literature where public procurement for innovation can also be used as an instrument to achieve other policy objectives (McCrudden, 2004).

In the health sector on the other hand, policy and regulation seems to have an inhibiting effect on innovation. Due to concerns about patient safety and thus strict requirements on clinical trials and approval procedures, new product development timelines grow long. In addition, when it comes to pharmaceuticals and vaccines, Finland’s practice of securing supply by imposing on suppliers and wholesalers to keep several months’ worth of safety stocks, based on past consumption, makes up a large part of the pharmaceutical procurer’s portfolio. In addition, this practice of securing supply also has implications for cash flow and business models in healthcare. The general principles of public procurement were also mentioned by informants in the health sector as a hindrance to introducing new things; the commonly used open procedure is supposed to guide procurers in setting requirements that would enable more than one supplier to give a tender for the searched solution, but at the same time innovations, e.g. new equipment or vaccines, may be offered by only one company.

4.2. Incentives

Numerous interviewees asserted that policy alone is insufficient to promote public procurement for innovation in the supply chain. In order for organisations to not only innovate but also propose innovative solutions, they must appreciate that there are other benefits for them, especially financial.

According to some of the informants, in the energy sector the carrot has proved mightier than the stick in the last few decades. The financial incentives for renewable energies have increased the share of wind and solar energy production in Europe, bringing in new solutions and products for energy production. The incentives for production have driven the innovations on the supplier side to create a greener market offering.

Additionally, the soon to be adopted EU directives make special mention of updating the public procurement process to facilitate the participation of small- to medium-sized enterprises. Informants in the energy sector noted how SMEs may have innovative ideas but find that
entering into tenders for public procurement requires what is to them large amounts of time and money. These are precious resources for many SMEs. However, offering incentives such as piloting, partnering and retention of intellectual property rights (IPR) encourages SMEs to take part in public tendering. For many Finnish SMEs, IPR can be used as a part of other solutions which can then be sold in other markets.

4.3. Proof of concept and product trials

A point that emerged in some interviews in the energy sector is what they referred to as the Finnish mind-set that leaned towards perfection and unease with failure. Informants reported that innovators in Finland wanted to bring to the public a “perfect” product; this means that if innovators deem their product not ready, they were unlikely to propose it as a solution.

This is where procurer-supplier piloting or proof of concept comes in. Piloting deployment of a new solution, perhaps with a cost sharing arrangement, allows for out of lab testing and improvements, demonstration of new solutions to other potential customers and the suitability of a solution to an articulated need. Further to this is that innovators need to understand that not all innovative solutions will be a success.

Product trials are allowed, and important for innovation, in the health care sector also, but the trials and test of new products are separate from the procurement procedure, since the products put in as tender must be mature. The product trials do not guarantee a future contract for the supplier, but information about the market offering may go into the public procurement process via the feedback loop between the end-user and the procurer.

4.4. Risk appetite

Separate but still connected to the previous point is the energy sector's ability to mitigate risk by having trial solutions in the real world. Piloting a solution requires cooperation between the procurer and the supplier. Public authorities can act as lead or example markets for innovative solutions. This has several advantages; risk and cost sharing between procurer and supplier, a demonstration of new products or services for other potential customers, a learning opportunity for users and the chance to test and improve the solution in the real world. In fact, Finland has established practice in public procurers and consumers being lead users for innovative products that were later diffused to the wider market (Czarnitzki et al., 2007).

Informants in the energy sector stated how their likelihood of proposing and using innovative solutions is affected by their having to fulfil conflicting demands. Interviewees reported that while they were urged to be more innovative, they were also bound by existing service level agreements related to security of supply. This contributed to their risk aversion in trying out new solutions. However, energy sector organisations pointed out that societal attitudes have in the past and can in the future influence innovation and adoption of new products, services and processes; for instance, sufficient demand from end users. This means that for the market to achieve critical mass there should be enough customer demand, which also means that a location would need to have enough like-minded potential customers. Interacting with customers in new ways is likely to bring about the use of innovative business models. The critical mass could be sparked by public procurement hence mitigating some of the risk.

Another issue mentioned in health care was related to the contract side of the process. Public procurement processes can be lengthy, but when the contract is awarded, suppliers need to be ready to meet contract requirements within a very short time. In order to avoid penalties, suppliers might need to build up a local storage although they are not yet guaranteed the contract. This adds risk on the supplier side and might inhibit them from submitting a tender.
New contract models that would enable the supplier to build up storages after the awarding of
the contract, or to secure availability of goods in the first months of the contract period in more
flexible ways, could better balance the risks of the provider and the procurer.

4.5. Information exchange

The new EU directives aim to simplify the competitive dialogue procedure, as well as enable
innovation partnerships between the demand and supply sides. This level of dialogue acts as a
route for information exchange. Both energy and health sector informants asserted that being
better informed about public authority long range plans meant that they could also plan better
for the inclusion of innovation in their strategy as some innovations had long lead times and
high costs. For procurers, dialogue with suppliers served to inform them of what solutions were
available and at what stage of development.

Informants in both sectors admitted that innovation, or the knowledge of new solutions, was
affected by organisational structures and siloes. They added that more dialogue and therefore
understanding between subject matter experts and procurement experts would help to lessen
the risk aversion many times associated with the public procurement process. Specialist
knowledge in specific areas of actual innovation and in the area of procurement is fragmented
within an organisation. Coordination between different departments can at best foster
innovation by making explicit the needs of the functional area and coding them into
requirements for solution by the procurement expert.

While the upcoming legislation was hoped to bring about more innovative partnering, some
informants said that while officially a new tool is added to the public procurement tool box, the
possibilities for similar dialogue have existed before. According to this view barriers to
adopting these existing approaches have been insecurity and risk averseness. For many
informants “the market court” is something they would rather avoid. For example, the current
legislation does not, as interpreted by the informants in this study, forbid the procuring entity
to engaging in dialogue with potential suppliers prior to setting out a tender, even if after the
tender is out, they are bound by law not to discuss with potential suppliers. In the health care
sector however, open and restricted procedures were the ones described by informants when
asked to describe their procurement process. Hence while the new legislation might promote
competitive dialogue and information exchange across silos, the existence of the tool might not
necessarily break the cycle of caution.

4.6. Cost

Cost is an aspect that affects public procurement at different points in the procurement process.
To start, both procurers and suppliers are affected by prevailing economic conditions and
budgetary constraints (Caldwell et al., 2005).

For procurers, budget limits influence how much they can spend on purchasing goods and
services which may lead to their selecting what appears to be the cheaper solution. However,
considered over a longer period, such a solution may end up having a higher total life cycle
cost. The new directives advise procurers to take into account long-term financial benefits in
evaluating tenders.

Supplier informants asserted that cost is likely to trigger innovation in more than one area. On
the supplier side, financing the development of innovation had a bearing on their investment in

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2 The Market Court is a special court hearing market law, competition law, public procurement and civil IPR cases
in Finland
innovation. This is especially relevant if there does not seem to be a guaranteed market for an innovative product or service. Some form of cost or risk sharing, e.g. piloting a solution, was proposed as a resolution that could spur innovation.

4.7. Requirements setting and awarding of contracts

Procurement has become more professionalised in recent years in terms of operationalising needs and standardising procedure. This has however also increased the length and rigidity of the procurement process. In the health care sector, several informants pointed out that the public procurement legislation adopted in Finland is stricter than when compared to other countries. This discouraged suppliers from suggesting innovative solutions to problems. Collaboration, information sharing and dialogue were named as factors in overcoming this. Collaboration in the form of partnering among many organisations to deliver one contract was also claimed to be one path in which innovative solutions could be brought to market.

4.8. Market characteristics

Finally, the size and structure of the market seem to have an impact on the fostering of innovation through public procurement processes. For the health care sector, the Finnish market is small compared to other markets, and companies providing pharmaceuticals and medical devices are often global players. They might not be motivated to innovate for the Finnish market specifically since it has only 5.5 million potential beneficiaries.

Both the health and energy sectors are dominated in some echelons of the supply chain by a few actors. The informants communicated that there seems to be an ongoing trend to consolidate and create larger buyer organisations with more bargaining power in order to lower the price. This might however make it more difficult to distinguish individual needs.

5. CASCADING INNOVATION IN THE SUPPLY CHAIN

In the preceding section, we identified factors currently affecting public procurement for innovation. In this section, we will first present examples of the current paths for adopting innovation through public procurement in the health and energy sectors. Then, using the factors presented in section 4, supply chain management principles discussed earlier and the revised EU directives on public procurement, we analyse how innovation can be cascaded in a supply network.

5.1. Current paths for public procurement for innovation in the health and energy sectors in Finland

With information from interviewees and from legislation, in figures 5.1 and 5.2 we show the possible paths for cascading innovation through public procurement in the health and energy sectors respectively. These paths have been depicted as a process culminating into a market offering for goods, services or works that can be used by the public. Both figures show simplified versions of the current public procurement procedure as described by key informants in both sectors.
From Figure 5.1, the health care public procurement process starts with the identification of needs, which then leads to a decision to tender, followed by market research, setting of requirements, announcement of the tendering process, receipt and comparison of tenders, formulation of a contract, ordering and finally use of what has been ordered. Running parallel to this process is development of innovative solution or product of the potential supplier that starts with need identification, a decision to develop a solution, solution or product development, clinical testing, market approval and market offering. The market offering goes into the procurement process as a tender, if it fulfils the requirements.

Before setting the requirements, the procurer may carry out market research to learn about available products on the market, and even products in development. The procurer often also speaks with end-users, i.e. doctors and nurses, who are subject matter experts. Besides the goods that come to the end users through public contracts, other new market offerings may be tried out in the hospitals in small volumes. In addition, hospitals can cooperate with manufacturers in the clinical testing phase of the product development process, which is illustrated in Figure 5.1 as clinical trials at the hospital. The end-users experiences from these alternative products (i.e. not procured on the basis of public contracts) might later transfer to the requirement setting stage of the procurement through information exchange between procurer and end-user.

Figure 5.2 Interaction between public procurement and the development of a market offering in the energy sector in Finland

Figure 5.2 shows that in the energy sector also the starting point for the procurement process is needs identification that results in a decision to tender, followed by market research, setting of requirements, announcement of a tendering process, receipt and comparison of tenders, and finally the contract. Meanwhile, solution development for energy providers also starts with needs identification, followed by the development of a market offering, which might have to go through a market approval process, before there is a market offering that can be submitted
to the tendering process. The awarded supplier then enters into a contract with the public procurer, after which electricity is distributed and used.

5.2. Cascading innovation in a supply network

In this section, we analyse how innovation can be cascaded in a supply network, using the factors presented in section 4, supply chain management principles discussed earlier and the revised EU directives on public procurement. The reader should note that as stated earlier, organisations in a supply network are linked. Therefore innovation in one organisation can lead to innovation in organisations in the same supply network but that do not interface directly with the (public) procurer. This is how innovation can be cascaded in the supply chain via public procurement.

There are some differences between the two sectors. In the energy sector, the primary “product”, electrical energy, remains unchanged. This is especially so from the end-users’ perspective. This is in contrast to the health sector where interviewees talked about development of a range of different products and solutions that reached the end-user. In the energy sector discussions of innovative solutions related more to processes (e.g. smart grids) and infrastructure (e.g. localised energy production) than to the “product” provided. For the end-user, the use of alternative forms of electricity may not be as complex as for product trials and clinical testing in the healthcare sector. Nonetheless, the energy sector also has points at which the procurement and adoption of innovation can be affected, which then leads to cascading innovation in the supply network. These points have to do with the sources (e.g. renewable energy), distribution (e.g. smart grids) and to a lesser extent consumption (e.g. smart buildings or devices) of energy. Key informants asserted that integration of non-controllable sources of energy, e.g. solar and wind, into the existing grid would require changes to the grid. While such changes would require large investments, this also requires innovation in production and distribution of electrical power thereby cascading innovation in the supply network. Innovation in generation would cascade to the rest of the supply network in distribution and even metering.

Related to this, public authorities have other policy objectives, e.g. emissions reductions, where PPI can be part of the solution. The new EU directives no longer specifically state lowest price as a contract award criterion, and public authorities may therefore, to a larger extent than before, award a contract to a higher priced bid that fulfils requirements and helps them meet other policy objectives. Additionally, initial investment and production costs for renewable energy from solar and wind could be offset by use of innovative partnerships with cost sharing of risk and rewards between supplier and procurer.

From the parallel processes outlined in the previous chapter, there are various points at which PPI can influence cascading of innovation in the supply network. One point is during need identification and before setting of requirements. At this point the procurer can conduct market research to learn about products available on the market and products in development. Knowledge exchange between procurer and supplier may lead to better understanding of needs leading to development of innovative solutions that can later be tendered. Key informants pointed to long-term relationships, a SCM principle, as enabling better information exchange between parties involved. Also, knowing that there is a ready market for innovative solutions can act as an incentive for first tier suppliers and their suppliers to invest in innovative solutions (Kim, 2000).

Procurers in both sectors reported that possible triggers for procurement activities were contract end-of-life or perceived needs from end-users. This means that procurers interact with end-users, e.g. doctors and nurses in healthcare, who are also subject matter experts. Using
competitive dialogue, procurers can act as middlemen between end-users and suppliers; the procurer’s role can be in getting end-user needs directly to the supplier and also in using their expertise to translate end-user needs into requirements suitable for tender. This is another point at which public procurement can act to spur innovation at different levels of the supply network. Incorporating customers involves going beyond the first tier supplier and procurer interface and is a way cascading innovation in the supply network.

Some informants claimed that support from political leadership could act as encouragement for public procurers interested in seeking and adopting innovative solutions. A visible display of political will for innovation also sends a signal to the wider supply chain, beyond the procurer and supplier, thereby helping to cascade innovation in the supply chain. In addition to shaping supply, the regulations can also specify what and how public entities should procure, shaping the demand from the public side. This way the demand from the public sector gives inventions a market to become innovations, or even drives for completely new solutions.

In both sectors, in addition to the development of market offerings, key informants spoke of some innovations not be directly linked with the public procurement process, i.e. solutions not procured by the public authority. For example wholesalers in the health care sector mentioned that they focus on developing services for both the preceding and subsequent tiers in the supply chain. Another example is that both energy and health care organisations in the public sector engage in development projects together with industry, but that is outside the public procurement process. However, such collaboration contributes to strengthening the supplier-procurer relationship for the longer-term which may be used to advantage in the formal public procurement process. When the new EU directives are incorporated, such collaboration can be formalised and undertaken in the form of innovative partnerships, and the outcome of the partnership directly procured by the public organisation.

6. CONCLUSIONS

New rules in on public procurement are expected to change the landscape of public procurement in general, and for innovation in particular, in the European Union. In this work, we have identified factors which affect public procurement for innovation in two sectors in Finland; healthcare and energy. Using this information, practice from supply chain management and information from revised EU directives on public procurement, we provided insights into how innovation can be cascaded in a supply network.

The upcoming legislation change and the discussion it has raised on public procurement for innovation makes this study timely. The study raises awareness of the interlinkages in of the public procurement processes and the supply chains in the health care and energy sectors. The study points to what actions organisations can take to increase adoption of innovative solutions in line with the aims of the new EU directives, of helping to solve societal challenges or to support the Europe 2020 strategy for smart, sustainable and inclusive growth.

Innovation, broadly defined, may happen at any tier in the supply chain, but there are limited formal entry points for a new market offering into the public procurement process. In the Finnish context, there is an awareness of the need for innovation and its associated benefits and yet informants contend that more could be done to use public procurement as an instrument to foster innovation and cascade it in the supply network.

Innovation cuts across numerous subject areas, involves many organisations and is governed by authorities and rules at various levels. Public procurement for innovation needs to be dealt
with in an overlapping space that has a combination of know-how, policy and political will. Different public authorities may have differing primary policy goals to meet. Alignment, to some extent, of some of these policies, including that of innovation may aid in cascading innovation of the supply chain. With this approach, it is possible to effectively utilise public procurement for innovation as a policy goal in itself, as well as to meet other policy objectives such as increased competitiveness and job creation. Public procurement authorities have the possibility to harness the economies of scale possible through public demand and public participation in fostering innovation.

This study contributed to the literature on innovation in supply chains through linking the legislative aspects with the supply chain perspective. This led to the identification of eight factors in the health care and energy sectors in Finland that affect PPI. These factors are interlinked, and also help to highlight how public procurement can happen in order to both comply with legislation and to foster innovation. The study also resulted in the mapping of the connection between procurement and innovation in the case sectors.

6.1. Limitations and future research

This paper presented results from the initial part of an ongoing, longitudinal study about public procurement for innovation. The study is limited by the fact that not all data points identified through the snowballing sampling method have been interviewed. Later parts of the study will gather more data from the sectors included in this paper, and will also expand the study to a third, yet to be identified, sector. Detailed mapping and contrasting of public procurement for innovation of the three sectors will then be carried out.

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REFERENCES

Beamon, B. M. (1999), "Designing the green supply chain", *Logistics information management*, vol. 12, No. 4, pp. 332-342.


