A TENTATIVE MODEL OF A DEMAND SYSTEM FOR PUBLIC PROCUREMENT OF INNOVATION

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ABSTRACT

In the last ten years a new policy discourse on public procurement has emerged. Earlier emphasis on efficiency, competition and transparency has been complemented by strives aiming at promoting the role of public procurement as a means to stimulate innovation. This policy development calls for an understanding of public agencies not only as providers of public service, but also as facilitators of innovation, an understanding of public agencies relatively underdeveloped in current academic analysis. To help ameliorate this shortcoming, the paper presents a tentative conceptual model of a demand system for public procurement of innovation and thus attempts to summarize knowledge relevant for strives to systematically use public procurement as a means to stimulate innovation. The model integrates the role of governments, suppliers, experts, users, other stakeholders and different methods and procedures relevant for demanding innovation.

INTRODUCTION

Although the role of public procurement of innovations have been discussed in many parts of the world such as e.g. Japan (Myoken 2010); India (Mani, 2003), New Zealand (Ministry of Economic Development, 2005) and Canada (Currie, 2005) and elsewhere, this paper mainly draws on developments in the European Union (EU). For the EU public procurement was identified as an important tool for reaching the innovation targets drawn up in the wake of the Lisbon agenda goals, set to increase competitive advantage in a global economy (European Council, 2000; European Commission, 2003; European Commission, 2005; Edler et al., 2005). In an EC Expert Group report by Aho and colleagues it was established that the EU is falling behind in terms of productivity and ability to capitalize on application of ICT; that major European firms site R&D activities outside the EU an that the EU is locked into unmodernised

traditional sectors and under-investing in service sector R & D. The Expert Group further recommended to "[u]se public procurement to drive demand for innovative goods, while at the same time improving the level of public services" (Aho et al, 2006, p. 6).

One basic justification for making public agencies more prone to innovation generation lies in the fact that public procurement represents 16% of EU GDP, a purchasing power, which if directed wisely could significantly boost supplier-side innovation. The importance of public procurement of research and development and the fact that countries such as USA or Japan which have adopted more strategically focused procurement policies have ran ahead of the EU in terms of creating demand for R&D, further justifies this policy focus (National IST Research Directors Forum, 2006). In a comparison between EU and US expenditure on "R & D procurement", it was found that "EU spending here is 4 times less (approximately $3,4 Bn) than the US – after the elimination of expenditures on military procurement, with the addition of which the US lead over the EU increases to a factor of 20" (ibid., p. 10).

It seems, then, as if the pendulum has changed direction, and the emphasis on market forces has lost ground in favour of the public sector. "Government is suddenly seen as a fundamental provider rather than an adjunct to the business of running the economy" (Callender and Matthews, 2002, p. 230). Although these authors discuss the US perspective, the way public procurement policies have developed in the recent past shows a similar pattern in the EU. Although the idea of using public procurement as a means to stimulate innovation existed also in the past, for many public agencies in the EU this is a sharply contrasting policy discourse compared to the 'neoliberal' efficiency-policies that prevailed before the millennium shift (Cox and Furlong, 1996; Martin Hartley and Cox, 1997; Arrowsmith, 2005, pp. 120–125).

This policy development has implications for theoretical analysis as have been discussed elsewhere (Rolfstam, 2009). The ambition here is more towards the practical end of the spectrum. Based on recent research, literature and recently formulated ambitions by policy makers to set up structures to generate innovation, this paper ultimately discusses a generic conceptual model of a demand system for public procurement of innovation and some points for further research. The model integrates an array of stakeholders and different methods and procedures relevant for demanding innovation.

PUBLIC PROCUREMENT AS AN ENGINE FOR INNOVATION

The main concern that drives the research discussed in this paper is the impact of public procurement on innovation – i.e. the extent to which public procurement generates innovations (other than process innovations within the procurement processes themselves). In other words, research in this area is concerned primarily with public procurement of innovations, rather than innovations in public procurement.

Innovation can be defined in terms of required input, outcome, or the cognitive requirements of innovation, and different definitions may be more or less useful depending on context and purpose. Sometimes this multifaceted character of the innovation notion creates confusion. To avoid such confusion a good starting point is to discuss possible understandings of innovation.

One way of defining innovation is to distinguish between production and innovation, as Joseph Schumpeter did. According to him, production concerns the utilisation of "materials and forces within our reach" (Schumpeter, 1934/ 1969, p. 65). Innovations (although Schumpeter used the word development) are new combinations manifested as the introduction of a new good, a new method of production, the opening up of a new market, or the use of a new source of supply of raw materials or new ways of organising industries (ibid., p. 65). Edquist (1997, p. 1) states that "[i]nnovations are new creations of economic significance", distinguishing, at least implicitly, between innovation and invention. An invention can involve all kinds of newness but, unlike an innovation, has not yet proven its success on a market. Schumpeter also makes distinct the difference between product and process innovation, where the former is the "introduction of a new good" and the latter "the introduction of new method of production" (Schumpeter, 1934, p. 66).

The definitions discussed in the preceding paragraph treat innovation mainly as an ex post phenomenon. This is perfectly natural, as "outcomes of innovative efforts can hardly be known ex ante" (Dosi, 1988, p. 222). Still, this means that they are less effective in capturing the underlying mechanisms that actually lead to innovation, and this may sometimes be necessary. In other words, there is a need to understand not only what innovation is, but also how innovation happens. Thus, Dosi characterises innovation as "the search for, and the discovery, experimentation, development, imitation, and adoption of new products, new production processes and new organizational set-ups" (ibid., p. 222). This search is also cumulative, in the sense that prior knowledge determines the possibilities to exploit new technical possibilities (ibid., pp. 222–223). In a similar way,

Lundvall argues that “the most fundamental resource in the modern economy is knowledge, and, accordingly, that the most important process is learning” (Lundvall, 1992, p. 1). Edquist establishes that innovation “is a matter of producing new knowledge or combining existing knowledge in new ways” (Edquist, 1997, p. 16).

Two additional concepts related to innovation are diffusion and adoption. Diffusion, adoption and innovation are to some extent overlapping concepts. Sometimes, however, it is necessary to keep them distinct. An innovation may be seen as an invention that becomes commercially successful on a market, i.e. is adopted by users, i.e. diffused. An innovation may also be incrementally altered over its diffusion time, i.e. exposed to post-innovation improvements (Coombs et al., 1987, p. 130), which might affect the diffusion curve. One view that separates diffusion from adoption regards the former as the study on an aggregate level of e.g. a sample of firms or adopting units among which adoption would take place. “The fundamental elements in the process of diffusion are the innovation which diffuses, the population of potential adopters and their process of decision making” (Coombs et al., 1987, p. 121). From that perspective, innovation is defined as “an idea, practice, or object that is perceived as new by an individual or other unit of adoption” (Rogers, 1995, p. 11). Diffusion then, is this idea, practice or object “communicated through certain channels over time among the members of a social system” (ibid., p. 5.)

There exist ambiguity how public procurement of innovation is defined and also variation in what terms are used to define it. For instance, public procurement of innovation has been defined as “the purchase of goods and services that do not exist, or need to be improved and hence require research and innovation to meet specified user needs” (European Commission, 2005, p. 5). Hans Westling (1991, p. 43), writing about the Swedish construction sector, maintains that “‘[t]echnology procurement’ is a form of purchasing aimed at directly stimulating innovation”. Such a definition at least implicitly includes activities other than the mere act of purchasing understood as ‘placing the order’, such as finding the right supplier, and negotiations. Following the Swedish Energy Agency “[t]echnology procurement is a complete tender process with the purpose of promoting and speed up the development of new technology. The purpose of technology procurement is to develop new products, systems or processes that meet the procurer’s demand” (Persson, 2003, p. 5).

Without providing an explicit definition of innovative public procurement, van Valkenburg and Nagelkerke (2006) report on the development of new procurement practices for large infrastructure projects in the Dutch Department of Transport and Water

Management. Through the application of interweaving planning procedures, suppliers are invited to participate already at the planning stage of a project. With such an approach, the boundaries between the demand-side and the supply-side become indistinct. Rather, the process becomes more of a joint effort characterised by a high level of interaction between the involved stakeholders.

Another concept available in the literature is market transformation. The purpose of market transformation is "to introduce new products and services and to increase adoption of new products and services as well as existing but underutilised products and services" (Neij, 2001, p. 68). This concept concurs to some extent with a general understanding of public procurement of innovation. However, this perspective places a particular focus on the effects of procurement activities on the market. It can be seen as complementary to traditional public procurement perspectives. The concept is also broader, in the sense that it sometimes includes also private procurement.

Here, public procurement of innovation is understood as the *purchasing activities carried out by a public agency that lead to innovation*. This relatively broad understanding means for example that activities carried out both before (what is sometimes called the pre-procurement phase) and after the formal tender process should be taken into account; in principle activities that belong both to the commissioning cycle and the procurement cycle respectively (Murray, 2009). Examples of activities in the pre-procurement phase would be scanning of markets and emerging technologies. Examples of activities after completion of the formal tender process is concluded can for instance be evaluation of project outcomes and collection of lessons learned to improve procurement projects in the future.

In an economy shaped by "the perennial gales of creative destruction" (Schumpeter, 1976, p. 84), firms engaging in R&D leading to innovation will gain new knowledge and competencies, which in turn will increase competitive advantage over firms that do not engage in such activities. This means that, in the long run, on average, innovative firms will survive and grow to a lager extent than those firms that are not innovative. Public agencies on different levels therefore can and may want to develop "knowledge policies" to promote e.g. scientific progress or development within a specific sector in order to stimulate innovation (Lundvall and Borrás, 2005).

If one wants to evaluate public procurement of innovation, or policies dealing with public procurement of innovation in general, the results of such evaluations will depend on what definition of innovation is used. One such illustrative example is the attempt by the Swedish

Board for Technical Development to procure a computer to be used in the Swedish schools in the early 1980 as reported by Kaiserfeld (2000). Eventually the project was terminated without rendering the intended outcome, because companies elsewhere were able to introduce to the market MS-DOS-compatible computers at lower cost. From a strict Schumpeterian/ Edquistian interpretation of innovation, the school computer project was a failure as the project did not produce an innovation successful on the market. The knowledge built up among the engineers who had worked in the project became useful in other projects. Thus, the project did help to diffuse knowledge and definitely offered opportunities for search and discovery according to the Dosi and Roger's definition of innovation and diffusion.

Similarly conclusions are derivable from a Dutch study on the build-up of systemic functions over time in bio fuels Netherlands (Suurs and Heckert, 2007). The story included an engine running on bio fuels that was procured and successfully developed as part of an ambition to create a bio fuel system. The problem with this specific engine, however, was that no measures had been taken to establish a market for the product. Although the technology had been developed, the product never really became diffused. In this case, the innovation complied to some extent with many of the Schumpeterian criteria, and also with the Dosi definition, but not with the requirement for success on the market.

In general, the literature supports policy makers strives towards using public procurement as a means to stimulate innovation. In fact, it has been argued that public procurement as a demand-side innovation policy is more efficient than other supply-side policies (Edler and Georghiou, 2007; Geroski, 1990; Rothwell, 1981). It has also been shown that public agencies can move and create incentives for innovation in situations where private firms would normally hesitate. These situations are typically market failures or system failures that occur for instance in technology shifts where an emerging new technology is about to replace existing technology and thereby creates uncertainty regarding what is adequate focus for firms' R&D efforts. Such uncertainty existed for instance when digital technology was emerging in the telecom sector. It was because of rather explicit demand from the national telecom agencies that both Nokia in Finland and Ericsson in Sweden dared to start development of digital switches (Palmberg, 2002).

Although the policy development has rendered an accumulation of literature explicitly dealing with public procurement of innovation most of this recent work has been either conceptual work stressing the innovation potential in public procurement (e.g. Edler and Georghiou, 2007; Myoken, 2010), developing typologies (Hommen

and Rolfstam, 2009; Uyarra and Flanagan, 2009) or consisted of case studies (e.g. Phillips et al., 2007). This paper manifests a strive towards normative work with a foundation in empirical research, what has up to this point, been scarce.

To pursue this strive two fundamental assumptions or principles have guided the work. Firstly, although there are public agencies that have always been using procurement to develop new solutions, typically in the defence sector but also elsewhere, to many public agencies the current emphasis on innovation makes out a significant requirement for change. Secondly, like any organisation, public agencies evolve in and develop unique institutional set-ups and are therefore to be considered as distinct unique entities. This positioning should be seen in the light of what is commonly the case in practice: Inspired by success stories elsewhere, policy makers often attempt to copy these successes into their own domains. This "naïve borrowing of 'best-practices'" has been questioned in the context of policy making for Asian economies in transition (Lundvall, Intarakumnerd and Vang, 2006, p. 16). Similarly, authors writing about regional policies maintain that "successful borrowing or copying of a single institutional idea is quite difficult to achieve, since it is often the case that the imitated institution will not function in the same way in the context of another institutional set-up or configuration" (Eriksson, 2005, p. 53). In a similar manner, Tödtling and Trippl (2005, p. 1204) argue that "[i]t would be misleading … to conclude that innovation activities required to secure competitiveness are the same in all kinds of areas".

Following these observations, the purpose here is not to provide best-practice or concrete lessons learned from individual cases. The ambition has been to present a model that is normative enough to be useful, but unspecific enough to avoid "naïve borrowing". The route chosen here is thus not to suggest the complete recipe but merely to pinpoint where to strive in order to develop further public procurement of innovation in any public agency. This is done by discussing some 'success factors' for public procurement of innovation, derived from the case studies. Based on that discussion the paper concludes with an attempt to model a tentative demand system for public procurement of innovation.

METHOD

This paper build on research carried out between 2004 and up to present time presented in one conceptual paper and several case studies (Gavras et al, 2006; Hommen and Rolfstam, 2009; Rolfstam 2007a; Rolfstam, 2007b; Rolfstam et al., 2009; Rolfstam, 2009a). Thus, the overall methodological approach has been exploratory or

theory-building case study research (Eisenhardt, 1989). The first case was about a procurement project in Norway of a new maritime radio system; the second an attempt to procure an energy centre by a borough council in England; and the third case concerned the introduction of a new catheter into National Health Service (NHS) hospitals in England, a forth case the procurement of a bio-gas and upgrading plant in Sweden.

Data was collected through face to face and, in some cases telephone interviews with key persons; consultation of documents such as tender calls and; other written materials and reports. Thus, by relying on several sources construct validity has been improved (Yin, 1994). Interviewed were stakeholders with insights in the respective cases such as procurement experts, engineers, and other project team members. Also managers, directors, consultants and experts working for collaborating organisations were interviewed. Although questions were prepared in advance, interviews were carried out in an open-ended manner in order to make use of additional information given by interviewees.

The case studies did not employ theoretical propositions as such. Instead, theory was used as "sensitising schemes, which are more loosely assembled congeries of concepts intended only to sensitize and orient researchers and theorists to certain critical processes" (Turner, 1991, p. 10). Nor were the cases chosen through the application of statistical methods but because of their perceived information richness. Information-rich cases are those from which one can learn a great deal about issues of central importance to the purpose of the research (Patton, 2002, p. 46). Concerning the use of case study results to build more general theory, it is important to note that the results come from analytic rather than statistical generalisation (Yin, 1994, p. 30).

The research process carried out here resembles the one described by Christensen (2006), i.e. essentially an attempt to go from descriptive theory to normative theory. The researcher goes through three steps: observation, classification and the final stage in which relationships are defined. The Analysis begins with the generation and checking of explanatory hypotheses through within- and cross-case analysis in a rather dialectic fashion. The claim that "[v]irtually all empirical social research involves comparison of some sort" (Ragin, 1987, p. 1) is not opposed here. Findings in one case will suggest where to look in the other for correspondences or deviations that would then potentially generate new questions. Subsequently, hypotheses are refined and matched with supporting data. Eventually, more abstract second-level generalisation is achieved by comparison with conflicting and similar formulations drawn from the theoretical and

research literature, carried out in order to build internal validity, refine concepts, and raise the level of theorisation.

This dialectic process as applied here can be described as a process in which the institutional scope was widened and refined as a result of the knowledge gained. The starting point for this research was the assumption that procurement law as given by the EC Directives on Public Procurement hindered innovation. The first case suggested however that legislation was not the only institutional factor determining the possibilities for innovation in the context of public procurement projects. Consequently, in addition to legislation, institutions other than formal law were taken into account in the subsequent work. The second case focussed less on the effects of formal law and more on endogenous institutions as manifested in the rationalities of different organisations. To develop further the 'non-legal' institutional emphasis, the third case stressed the role of endogenous institutions by looking more specifically at the institutional interplay within a particular organisation. In other words one could say that the first case falsified the assertion that the rules prevent innovation, whereas the succeeding cases sought to find other institutional explanations for failure in attempts to do public procurement of innovation. The current paper contains an attempt to make a second-level generalisation of this research.

CASES OF PUBLIC PROCUREMENT

Here follows a brief description of four cases of public procurement of innovation.

Case 1: A maritime radio system

The first case dealt with how Telenor A/S, at the time the state-owned telecom agency in Norway, procured a new digital system for maritime radio communication intended to replace the existing analogue radio system. The project started in late 1990s and ended with the final delivery of the system at the end of 2002. The system facilitates communication between ships and other land-based entities; automatic connection to land-based telephone networks; transmission of text messages (telex and e-mail); Internet access and Morse code telegraphy. Through implementation of distributed operational control (DOC), the new system made it possible to operate one radio station remotely and thus increase flexibility for operators. The contract also included the development of a database system for storing data about ships.

As a preparation for the procurement project Telenor put some effort into scanning the market for potential suppliers. To increase competition and find the most suited supplier, Telenor consulted embassies, trade commissions and countries' yellow pages worldwide. When the tender call was published in 1998 the companies found in the search process were notified of the existence of the tender call. This meant that the procurers could expect that they had identified the supplier able to deliver the most innovative solution. The system was delivered in different steps, where each delivery was associated with performance and acceptance tests. Corresponding payment was transferred to the supplier once a delivery was found to meet requirements. The contract also stipulated that the supplier should pay fines upon failing to deliver according to the set up timetable - a clause that never needed to be invoked. By using a functional specification (as far as applicable), rather than a technical specification in the tender call, the procurers also left open the possibility for suppliers to develop solutions to meet the requirements according to their own preferences.

Although interaction with procurer and supplier was restricted and controlled in the pre-procurement phase, once the contract was signed interactive learning was also possible to take place between the procurer and the supplier. From the beginning of the project an expert on public procurement law was assigned to the project to monitor and safeguard compliance with the Procurement Directives. To the project was also assigned the technical expertise necessary to adequately specify what should be procured. In other words, the procurers knew what they wanted to buy. The project leadership also maintained rather strict policies to safeguard that information exchange with the supplier always went through the project manager at Telenor. Also, the decision procedures applied were rather strict. Late alternative suggestions on how to do things were in general not considered. Instead the focus remained on sticking to the plans already set.

Case 2: A wood-chip power plant

The second case deals with an attempt by Bracknell Forest Borough Council in UK, to procure a wood-chip-fuelled power plant. The borough council collaborated with a number of other organisations, as a part of a rather impressive re-generation project of the whole town centre. The tender notice was published in 2005 inviting suppliers to submit bids to build and operate the plant "over its economic life" (TED, 2005). On April 11, 2006, the project was however officially cancelled because the tender call failed to attract any bidders because the scheme had been judged "commercially

unviable" (TED, 2006). The project would, if successful, have rendered a state-of-the-art facility not seen in the UK before. The procurers also expected that the fuel requirements for the power plant would create a local market for fast-cropping timber.

One reason why the project failed was that the project did not manage to negotiate the differences between rationalities and organisation-specific institutional set-ups among the stakeholders. Stakeholders in the project were, apart from the Bracknell Forest Borough Council also the political leadership of the town; the Bracknell Forest Regeneration Partnership (BRP), a joint venture consisting of the major local land-owners; the Thames Valley Energy (TV Energy), an organisation devoted to the promotion of green energy; two EU funded energy development projects where one was the CONCERTO initiative, with the purpose of promoting and diffuse new knowledge on green technologies; and potential suppliers, i.e. private firms.

There prevailed different conflicting views on how the project should be managed. The procurers emphasised compliance with the procurement rules and best practice, while TV Energy was more interested in promoting green technology and less interested in following the procurement rules per se. Propelled by TV Energy and also by requirements associated with the EU funding, the specifications in the tender call were rather strictly demanding state-of-the-art sustainable technology which excluded bids based on already existing proven, but slightly less sustainable technologies from participating. For the BRP, the priority was on securing energy supply in the first place, not necessary sustainable energy supply.

The funding provided by CONCERTO initiative was connected to a series of other similar projects going on elsewhere in Europe. What was problematic was that the whole grant could be revoked if one participant elsewhere failed. This created an uncontrollable and less attractive risk for suppliers. The funding also came with requirements to participate in knowledge diffusion activities, which the commercial organizations were less prone to do. The timetable for the CONCERTO funding used for preparing the tender was incompatible with the developments of the regeneration project. The supplier and future operator needed to be able to guarantee a market before committing to the project. As the town centre was not built at the time for the tender, there were no tenants available to make such commitments. The local borough council also hesitated to make such commitments because of fear of doing something illegal.

Case 3: The silver-coated catheter

The third case study summarise an attempt by the English National Health Service (NHS) to procure and diffuse a new catheter throughout its Trusts in an attempt to combat Catheter Associated Urinary Tract Infections (CAUTIs). The innovation in this case was the Bardex IC silver alloy coated hydrogel catheter, supplied in UK by Bard Ltd. This was a catheter originally developed and sold on the US market. What distinguished the Bardex catheter from conventional catheters were anti-infective properties achieved through the silver coating used (c.f. NHS PASA-CEP, 2006). The supplier had provided information about the scientific background of the product, the evidence that showed it had antibacterial properties and then the most important factor in terms of implementation in a health setting, evidence that using it in certain population groups would actually reduce the number of health care associated infections.

In August 2004 the Rapid Review Panel was set up. Run by the Health Protection Agency on behalf of the Department of Health, the purpose with the panel was to encourage industry to come with ideas that would tackle the problems related to health care associated infection. The panel's task was to "assess new and novel equipment, materials, and other products or protocols that may be of value to the NHS in improving hospital infection control and reducing hospital acquired infections" (Health Protection Agency, 2006). One of the first products submitted to the Rapid Review Panel was the Bardex catheter. As one of very few products, the Bardex catheter received the top mark, i.e. the judgment was that it had "shown benefits that should be [made] available to NHS" (ibid, 2006). As a response to the evaluation by the Rapid Review Panel, NHS Purchasing and Supply Agency "fast-tracked" the Bardex catheter into the NHS Supply Chain.

Although these measures were taken, the Bardex catheter were relatively modestly diffused into NHS wards, mainly because a number of institutional barriers. One such barrier was organised scepticism among clinical staff and their requirement of a high level of proof before adopting an innovation. In comparison to other health care technologies, there appeared to be no clear champion for catheters as would be the case for other technologies more closely associated with a specific speciality. NHS is a relatively decentralized organization where centrally made decisions to make certain technologies available may not necessarily lead to adoption in lower layers of the organisation. Spending and returns from spending did not affect the same budget, which removed spending incentives. Although less expensive over its lifecycle, the Bardex catheter was more expensive per unit than conventional catheters. There were also problems in showing the value of the innovation (and hence

justifying adoption). Although proof supported the value of innovation the question remained what should be removed from the budget, to allow the adoption of the innovation. Commitments made in current contracts prevent re-allocating of resources.

Case 4: The biogas and upgrading plant

The case study concerns the public procurement project that lead to the development and finalization of a state of the art Biogas and Upgrading Plant in the Swedish town Västerås, a facility that was in operation in 2005. The system produces bio energy from organic waste generated by citizens in the region, ley crop grown by local farmers and grease trap removal sludge from restaurants and institutional kitchens in the area. The bio fuel that is produced is used in buses in the region, waste collection vehicles and cars. The system produces fuel quality biogas corresponding to 2.3 million litres (traditional) petrol every year. Some biogas that is not upgraded to fuel quality is used for production of electricity and heat. The system also produces residuals used as high quality fertilizers by local farmers. Every year the system receives 14000 tons of source-separated waste from households, 4000 tons of grease trap removal sludge, 5000 tons ley crop grown by local farmers.

A significant feature of the procurement project was the interaction between different stakeholders and the success in managing different stakeholder's interests and needs. The original idea of developing some kind of bio fuel facility came actually from the local farmers. For local farmers the ley crop production to be used for bio-fuel production would make out an alternative source of income for farmers in areas where food production is not profitable. Switching to farming for bio-fuel production would also then be a way of keeping farmers active and therefore maintaining an open farm landscape in the area.

Over the years several different meetings where held not only with formal stakeholders but also any organisation that could affect or be affected by the project. Examples of organisations involved are environmental authorities, city planning authorities, The Swedish food industry, The KRAV organisation, voluntary environmental organisations, public consumers organisations and the Swedish Association of Waste Management. Many of these external stakeholders played a concrete role in relation to the risk management and the decision to actually go ahead with the project.. Long-term agreements with local farmers were set-up to assure sufficient supply of ley crop to be used by the bio-plant. Long-term agreements with local bus company for buying bio-fuel were set-up to guarantee a supply marked for the product, bio fuel. Required legal

documents, e.g. related to environmental laws had to be in place. Before commencing with the project, the procurers sustained approving document from food industry verifying that the fertilizers that would come out of the system could be used for food production.

SUCCESS FACTORS FOR PUBLIC PROCUREMENT OF INNOVATION

Of the four cases discussed above, two (cases 1 and 4) were successful in the sense that they rendered the intended outcome, while the other two (cases 2 and 3) for different reasons did not meet initial expectations. This opens up a possibility to compare and identify some common features in successful projects and maybe also some common features of not so successful projects. Some 'success factors' founded in the cases are briefly summarised below.

Expertise on public procurement procedures and relevant law

Public procurement directives currently applied in the EU are Directive 2004/18 for works, supply and service contracts, and Directive 2004/17 for utilities contracts. On a general level, the Directives specify the procedures for how public contracts should be awarded. Briefly, this means that the public procurer is required to advertise new contracts offered Europe-wide; to hold a competition between interested firms to determine the winner of the contract; to exclude firms with lack of financial or technical capacity; to respect minimum time-limits to ensure that all interested firms have time to participate; award the contract based on criteria notified in advance; and provide information on the decisions made (Arrowsmith, 2005).

One significant feature of cases 1 and 4 was that the procurers made an effort to allocate expertise on procurement law to the project. In case 1, an engineer recruited in house was given the task to monitor that the project complied with the rules. In case 4, a very experienced consultant was working in the initial stages of the project. In case 2, one might argue that legal confidence among the procurers as well as legal awareness among suppliers could have prevented termination of the project. In case 3, legal issues were not important determinants for the outcome. For cases 2-3, other factors contributed to the outcome.

These findings suggest that it is important to allocate competence on public procurement law to projects dealing with public procurement of innovation, although such competence allocation may not be sufficient for successful outcomes.

Technical competence for specification

By definition, public procurement of innovation is a process where not all aspects of the procured item are known. As opposite to procurement of regular goods such as fuel, stationary etc, public procurement of innovation require some knowledge on available solutions on the market, how to run a development project and being able to actually know what exactly is the intended outcome. One relevant competence is the capability to formulate specifications in such a way that it allows suppliers to bring in innovative ideas. To allow for innovative ideas functional specification may be used. This means that procurers define desired outcomes rather than in technical detail the item to be procured.

In both the successful cases 1 and 4, technical competence were available to add sufficient competence for specification. In case 1, the project manager possessed a high degree of knowledge on the requirements of the radio system to be procured. In case 4, an experienced consultant added the necessary competence. In case 2, the issue related to specification can be seen in the restricting effect the tender call demanding green technologies had on suppliers. Had the requirements been formulated in a more open manner solutions based on already existing technologies could have been submitted. If one includes in the notion of 'specification' the whole contract set-up one could say that case 2 includes a story where the procurer failed to come up with specifications that harmonised with all involved stakeholders' rationalities. Case 3 dealing with essentially an unsolicited bid, the technical competence had a somewhat ambiguous role. Although the positive evaluation of the Rapid Review panel could analytically be seen as some kind of approval of the specification, the approval per se was insufficient for successful diffusion of the silver-coated catheter into NHS hospitals.

These findings seem to suggest that technical competence for specification is important. In more collaborative projects involving different stakeholders such competence may be problematic to apply.

Coordinating competence for co-operative procurement

Public procurement of innovation may mean that a public agency attempts to satisfy an intrinsic need. In some cases public procurement of innovation takes place as a collaboration project between several stakeholders with slightly different user requirements. One such example was when Norwegian emergency response agencies (such as the fire brigade, ambulance service and police) jointly procured a new radio communication system (Gavras et al., 2006). The most critical role for procurers in such projects may

not be to find the single best specification, but to arrive at a specification that would work for all stakeholders involved.

For case 1, the requirement for coordinating competence was less demanding, as the project essentially was a direct procurement satisfying internal needs. It could be argued that both case 2 and 3 suffered from lack of coordination and that this affected the outcome in a negative way. In case 2, the project failed to match the different stakeholders' needs. In case 3, the decentralised structure of NHS can in this perspective be seen as a coordination barrier (although there might be other reasons for appreciating organised scepticism among physicians). For case 4, interaction and coordination with an array of different stakeholders were a central success factor for the project.

This suggests that coordinating competence is importance for public procurement of innovation in cases of collaborative procurement, something already suggested in the literature (Hommen and Rolfstam, 2009).

General project management skills

Public procurement of innovation is not different from other innovation projects in the sense that their outcome may be determined by the quality of the project management. In the successful cases 1 and 4, general project management skills were allocated to the project. In case 1, information was handled in a strict way, and decisions were consistently followed. In case 4, the system performed better than planned. One reason for this was the allocation of the experienced consultant. For case 2, project management were restricted by the fact that the person who had initiated and championed the vision of a green power plant passed away half-way through the project. It could also be argued that the organisation itself created some challenges that did not occur in case 4. It seems as the set-up in case 2 failed to identify a leading organisation and it also became very hard to coordinate the stakeholders different strives. In case 4, although there were several collaborating organisations involved in the procurement project, these were acting united in a separate company.

A common feature of many successful projects involving public procurement of innovation is that they have been allocated an experienced manager either from within the organisation or as an external consultant (Wade and Björkman, 2004). If one looks at both case 1 and case 4, a clear idea of the intended outcome of the procurement project, sticking to agreed plans and, strict coordination of information may be other managerial success factors.

Allocation of resources for public procurers

Public procurement of innovation, as different from regular procurement is exceptional and does not normally take place within existing operative routines and budgets. Specifications of what to procure need to be developed; to find technologies and suppliers potentially able to deliver a solution also requires time consuming search; the appropriation and use of the procured item may also require fundamental changes within the organisation, etc. In case 2, the procurers were supposed to run the wood-chip power plant project in the same time as they were fulfilling their ordinary tasks, which was a working condition reducing chances for success. In case 1, the project team worked fulltime several years to complete the project. For case 3, among hospitals where the silver coated catheter was introduced and diffused, this happened because hospital management allocated additional funding to cover for the extra cost. Also physicians' organised scepticism implies claims for additional resources to be spent on evaluation research performed on the local level. Thus, one success factor for public procurement of innovation projects is definitely that procurers are allocated the additional time and resources necessary to deal with the additional tasks that come with public procurement of innovation.

Political support

Although ideas leading to innovative products may come from anywhere within or outside a public agency, the actual project aiming at procuring an innovation will not move forward unless (at some point) authorised by its political leadership. Understood as an exceptional activity, public procurement of innovation requires political support and decisions in order to enable procurers on the operational level to actually carry out the work. In case 1, the project was decided in the Norwegian parliament. The biogas plan in case 4 was a project perfectly in harmony with national policies aiming at moving away from fossil-based fuel. Often additional coordination activities are required which also need to be managed centrally. Political support for a project may assure that adequate resources are allocated for the project. The prestige in a project for instance supported by a minister would also help to increase interest among suppliers and other stakeholders. It should perhaps be noted that political support *without* actual allocation of resources for public procurers, as to some extent was the case for the procurers in Bracknell Forrest in case 2, may not be sufficient for successful public procurement of innovation. Furthermore, as illustrated by case 3, political support may not be sufficient for diffusion. Although a decision was made centrally to introduce the catheter into the NHS

supply chain, the central decision per se could not guarantee diffusion in the decentralised organisation. In case 4, however, the procurers enjoyed political support as well as being able to gain acceptance from stakeholders.

Risk management

As in any type of innovative work, public procurement of innovation is characterised by a certain degree of uncertainty regarding the outcome. Conducting public procurement of innovation means acceptance of technological risks; organisational and societal risks; market risks; financial and; turbulence risks (Tsipouri et al, 2010). Public procurement of innovation also sometimes fails (e.g. Rolfstam, 2007b). It has been argued that risk aversion in society as well as among public procurers needs to be remedied in order to face the challenge of global competition (Aho et al., 2006). Reducing risk averseness and consider risk sharing has also been pinpointed as important factors for strengthening the role of public procurement as a means to stimulate innovation (Nyiri et al., 2007). The risk averseness also connects with the policies developed at the end of 20th Century focussing on efficiency and reduction of public spending. It may be that a culture within public agencies need to be developed where risks to certain degree are allowed in the context of public procurement projects. In general public agencies need to find a balance between agency cost and application of risk management tools for future public procurement of innovation (Rolfstam, 2009b).

In case 1, certain measures of risk management were in place, for instance in the contract with the supplier. In case 4, the risk management included making necessary arrangements with stakeholders before commencing with the project. In case 2, one could see the decision to terminate the project without identifying a supplier, as a way of risk management. On the other hand, the unwillingness from the borough council to make a commitment as a future customer of the power plant could be considered as an example of risk aversion.

Public support

Public procurement of innovation may involve the development of technology where the public has a stake. A new system for handling waste in a municipality may be dependent on that households are willing to deliver their waste in a way the system can handle, as case 4 illustrates. A new power plant may be causing smell or risk, etc. Public procurement contracts may also have certain effects on existing industries in an area. Stakeholder commitment before the

start of a development project may be a very good way of avoiding problems that could potentially emerge once a new facility is built, as illustrated by case 4. If one in the notion 'public support' also includes support from users, it could be argued that one reason for the low diffusion rate of the silver-coated catheter in case 3 was lack of support, although, most of the barriers were institutional.

Supplier side understanding of public procurement procedures

Although public procurement of innovation in principle is not very different from private procurement of innovation, there are indeed elements of public procurement of innovation practices that do not occur frequently in the private sector. Certain ways of conducting public business comes from requirements in the EC Directives on Public Procurement. Others come from endogenous traditions and policies developed over many years within a specific public agency. Many times, firms failed attempts to become suppliers to the public sector can be explained by lack of understanding of the specific institutional set-up in a particular public agency. Another reason for failure may be that firms sometimes do not fully appreciate or understand the legal framework regulating public procurement. This was a problem in case 2 where especially one stakeholder showed little interest in complying with public procurement law. In case 1, it may be argued that the legal expert helped also the suppliers in the negotiation phase to avoid leaking information to competitors.

Institutional coordination

Public procurement of innovation should not merely be referring to the actual tender process. It may be that other changes are required to make an innovation fit into an organisation. It may also be that future users need to be consulted in order to make sure that innovations match user requirements. For a successful outcome institutional coordination or redesign may be required. There might be an array of institutional barriers within an organisation that prevents the internal diffusion of an innovation that has been procured. Measures such as budget reorganisation, evaluation studies, development of business cases that establish the value of an innovation for an organisation are examples of such institutional coordination occurring in case 3. In case 4, an array of coordination activities took place over the years, including opening up of new markets for bio-fuel and fertilizers, as well as changing garbage sorting habits among households.

Understanding of when there is (not) a system failure

In a capitalist system, the most important locus for innovation is the firm. Even if public procurement of innovation has been promoted the last few years, it is important not to make public procurement of innovation the default option for public agencies. Public procurement is justifiable when it *satisfies a social need not previously satisfied by the market*. In 'normal' situations, the market itself is probably the most efficient set-up for innovation. If applied in inadequate situations, as goes for any innovation policy, the effects of public procurement of innovation might be low or even counter-productive. Herein lies also a risk of becoming tempted to provide (de facto) state aid to national champions in a country. If a country cannot award procurement contracts for innovation to domestic firms because of prevailing competitive advantages of international firms, the answer can never be to choose underperforming domestic technology. The fact that both the successful cases 1 and 4 led to contract awards to foreign companies suggests that the focus was on finding the best solution rather than supporting a national champion.

Method development, for instance pre-commercial procurement

Public procurement of innovation is exceptional and may require new methods not previously applied within a specific public agency. One recently developed 'method' suggested by EU policy makers is the pre-commercial procurement. This is a method that tries to manage the balance between allowing for public procurement of research services which is allowed by the EC Procurement Directives, without violating rules on state aid to domestic firms and competition laws. It may also be that methods based on traditional procedures (as specified in the EC Directives for public procurement) may be developed in order to facilitate public procurement of innovation within a specific public agency or within a specific member state. The differences in the institutional set-up pointed to earlier (Edler et al, 2005, seem to remain in current strives to implement pre-commercial procurement among EU member states.

Although the cases discussed here took place before the general trend urging for method development they do offer some examples of pro-activity towards developing procurement practice. In case 1, the procurers made an effort to scan markets globally in order to find the best supplier. Another example is the initiative by the Department of Health to set up the Rapid Review Panel to enable innovation, as illustrated in case 3.

A DEMAND SYSTEM FOR PUBLIC PROCUREMENT OF INNOVATION

A public agency is typically designed and thought of as an entity that *delivers* a service. A hospital delivers health services; a school provides education; a library facilitates book loans and other information services, etc. In relation to innovation, however, public agencies are mostly seen as rather static or passive users. Very little emphasis is traditionally made on how to change aspects of how public services are delivered and the potential role public agencies may have to stimulate innovation. Figure 1 tries to summarize a model emerging from the idea of public agencies as potential creators of demand for innovation.

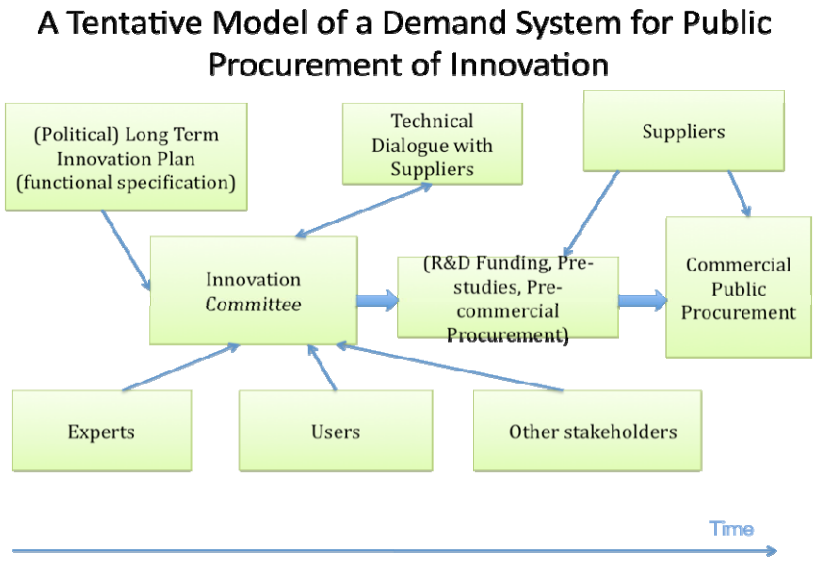

Figure 1. A Tentative Model of a Demand System for Public Procurement of Innovation.

The model provides a starting point for a discussion on how to use the success factors discussed in the previous sections in order to create a demand system for public procurement of innovation. In principle, the model could be applied on any level in society.

Given the institutional understanding of public agencies, public procurement of innovation becomes somewhat exceptional, i.e. an activity that is not part of the routine. In other words, public procurement of innovation requires political support. Thus, in the model, political support is one fundamental assumption. This can be manifested as a long-term master plan for a municipality or a strategy issued by a region to develop for instance, new hospitals (e.g. Voss, 2009). It is also politicians that can help to develop a culture in the public sector where certain level of risk in the context of public procurement of innovation may be accepted.

As was discussed above, public procurement of innovation, in the same way as any innovation project, requires skilled people and allocation of resources. In the model, this is captured by the inclusion of an innovation committee. The innovation committee assumes the operative leadership of a project. This committee should be managed by a very experienced person or supported by a very experienced person. It may be that the innovation committee may be using external experts for different specific task in the project, for instance on law, or specific technical aspects of the project. The Innovation committee should also possess coordination competences, to be able to handle collaborative public procurement of innovation.

Depending on the maturity of the technology about to be procured, the innovation committee may choose different actions. There might be a need to fund a research project. Another option is pre-commercial procurement, where a number of suppliers are invited to participate in the different steps that may eventually lead to a commercial procurement process. The innovation committee may already have in their possession knowledge about the item to be procured that they can formulate a functional specification allowing for innovation in a commercial tender. There might also be a need for method development, and routines for making the required decisions.

One important means for public procurers to keep updated on the possibilities in emerging technologies is a continuous interaction with suppliers that of course need to be carried out in compliance with procurement law. Staying updated also means that procurers will be aware of innovations supplied directly by the market, and thus have the ability to avoid initiating public procurement where there is no system failure. Currently, suppliers may be hesitating or reluctant to respond to public tender calls for different reasons. Another purpose with supplier interaction is thus to inform and explain public procurement practices.

As was discussed above, the success of a procurement project is sometimes determined by other stakeholders than the procurer and supplier. One such example was the case of a bio-fuel plant integrating local farmers, households, vehicles running on bio-fuels etc. (Rolfstam, 2010). In another case, the fact that not all stakeholder needs could be satisfied led to the termination of the tender process without awarding a contract (Rolfstam, 2007b). Thus, stakeholders should be identified and negotiated with before the actual project is initiated.

One often neglected potential source of innovation is the people who work in public agencies. A demand model for capturing innovation should therefore include activities that take into account ideas and emerging needs from practice. What is important then is that the

innovation committee establishes incentives and communication structures that enable interaction with users of technology.

One of the dangers with attempting to rather explicitly list items claimed to be of particular relevance for a certain preferred outcome is that someone else might find other items more important. Acknowledging that scenario as a possible outcome, may hopefully not exclude the possibility that some parts of the provocation can render some effects in the real world, that will eventually help to develop public procurement of innovation in practice.

CONCLUSION

Justified in the relatively recently developed policy focus on public procurement as a means to stimulate innovation, the paper presents four cases of public procurement of innovation. Based on a cross-case analysis of the cases, some success-factors for public procurement of innovation are identified and discussed. Based on these success-factors the paper develops a tentative model of a demand system for public procurement of innovation. The latter part of this paper then, should be seen as an attempt to start a discussion assuming a perspective where public agencies are seen not only as providers of public services but also as a source and generator of innovation.

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