

Title

Coordinated unbundling: a way to stimulate entrepreneurship through Public Procurement for Innovation

Authors

Bram Timmermans, IKE/EOB, Department of Business and Management, Aalborg University, Fibigerstræde 4, 9220, Aalborg Øst, Denmark.
E-mail: bram@business.aau.dk

Jon Mikel Zabala-Iturriagagoitia, Deusto Business School, Deusto University, Camino de Mundaiz 50, 20012 San Sebastián, Spain.
CIRCLE, Lund University, Solvegatan 16, PO Box 117, SE-22100, Lund, Sweden.
E-mail: jmzabala@deusto.es

Abstract

Public procurement for innovation is a matter of using public demand to trigger innovation. Empirical studies have demonstrated that demand-based policy instruments can be considered to be a powerful tool in stimulating innovative processes among existing firms; however, the existing literature has not focused on the role this policy instrument can play in the promotion of (knowledge-intensive) entrepreneurship.

This paper investigates this link in more detail and introduces the concept of coordinated unbundling as a strategy that can facilitate this purpose. We also present a framework on how to organise public procurement for innovation around this unbundling strategy and provide a set of challenges that need to be addressed.

Keywords

Public Procurement for Innovation; Knowledge-Intensive Entrepreneurship; Coordinated unbundling; Entrepreneurial Opportunity; Demand-driven policy.

1. Introduction

Procurement by the public sector makes up a sizeable part of a country's Gross Domestic Product (GDP). To illustrate this, in the last 10 years, public authorities in the European Union have spent between 15 and 20 percent of the total GDP annually on public procurement. Despite the fact that these figures vary between member states, public procurement represents a key source of demand for firms in all countries, particularly in sectors such as construction, health care, defence material, energy and transport. There are various kinds of procurement initiatives, but the vast majority of procurement can be described as regular public procurement (i.e. the acquisition of standard products bought off-the-shelf). Because it is such a significant player, the public sector could act strategically and take innovation into account when purchasing goods and services. Despite this high innovative potential, general public procurement is not geared towards promoting innovation (Uyarra and Flanagan, 2009). For this reason, making individuals and organisations involved in regular procurement more inclined to use their resources for innovative purposes becomes increasingly more relevant. There are ample opportunities for diverting the procurement of existing goods and services to innovation, i.e. product and process innovations. In these instances, the element of innovation may lead to better results for the procurer in terms of needs satisfaction and societal problem solving.¹

One of the main rationales for implementing procurement policies is the relevant role they can play in stimulating innovation from the demand side (Edquist and Hommen, 1999). These procurement policies have been given several names, such as innovative public procurement, public innovation procurement and public procurement of innovation (Lawther and Martin, 2005; Rolfstam, 2007; PRO-INNO, 2007; Brutscher et al., 2009; Uyarra and Flanagan, 2009; Kalvet and Lember, 2010; Rolfstam et al., 2011), which illustrates the ambiguity of their use. Concepts such as innovative public procurement lead to a misleading understanding of the instrument, as they reflect the innovative character of the procurement process. Something similar occurs with public procurement of innovation. This concept leads our thoughts in the sense of procuring certain innovations, when the procurement process itself is uncertain and the achievement of innovations is not always guaranteed. The phenomenon is a matter of using public demand to trigger innovation. Accordingly, in this paper we will use the term "Public Procurement for Innovation" (PPI), which we believe illustrates the intention of this policy instrument.²

The various cases available in the literature (Edquist et al., 2000; Neij, 2001; Hommen and Rolfstam, 2009) illustrate the strength of public procurement for stimulating innovation processes and achieving innovative outputs - products, services and processes (Rothwell and Zegveld, 1981; Geroski, 1990; Edler and Georghiou, 2007; OECD, 2011). However, these case studies only illustrate how public demand triggers innovation conducted by established, mainly large, firms.

Increasingly the issue of Small and Medium-Sized Enterprises (SMEs) in relation to PPI has been addressed (European Commission, 2000; Karjalainen and Kemppainen, 2008; Piga and Treumer, 2012). All these initiatives aim at promoting innovative behaviour among existing firms. However, it has not yet been discussed whether and how procurement policies can support not only the development of innovative activities but also to what extent PPI can lead to Knowledge-Intensive Entrepreneurship (KIE). For a definition of KIE we let us inspire by Malerba and McKelvey (2010). However, in contrast to their definition, which emphasizes new firm creation, we take a broader understanding of entrepreneurship and define KIE as *entrepreneurial activities*³ that are innovative, have significant knowledge intensity and develop innovative opportunities in diverse sectors.

This paper aims at offering a conceptual framework for analysing the potential of PPI and linking it with KIE. We would like to contribute to a discussion on whether and how the public sector can provide entrepreneurial opportunities, in particular KIE, by means of PPI (Shane and Venkataraman, 2000). The rationale for focusing on this type of entrepreneurship is the perception that KIE is a necessary mechanism and an agent of change mediating between the creation of knowledge and innovation and its transformation into economic activity.

As it can be assumed, the vast majority of this KIE will revolve around small organizational forms. Thus, it is important to consider that the procurement contract, as formulated in the public call, needs to be divided into smaller parts. For that reason, we believe that a process of coordinated unbundling can provide a better access point for entrepreneurial activities to enter the public procurement process. This paper addresses in more detail the role of PPI and entrepreneurship, the role of coordinated unbundling and the challenges associated to its organization.

This paper is divided into six sections. In Section 2, we introduce and define public procurement for innovation as one of the demand-side instruments that support the development and diffusion of innovation. Section 3 links public procurement for innovation with knowledge-intensive entrepreneurship. In here we discuss how public procurement for innovation is often implemented in relation to existing firms, and how it could also support knowledge-intensive entrepreneurship. In Section 4 we introduce the concept of coordinated unbundling and the strength of this strategy in supporting knowledge-intensive entrepreneurship. In addition, we also address how the public procurement concept can be organised around this unbundling strategy. In Section 5 we present the challenges that are particularly relevant in the link between public procurement for innovation and knowledge-intensive entrepreneurship. The paper concludes with some final remarks in Section 6.

2. Public Procurement for Innovation: a demand-based policy to support innovation activities

According to Edler and Georghiou (2007), public procurement is one of the four types of instruments that can support the development of innovative activities from the demand side, other instruments being; systemic policies, regulation, and support of private demand. The rationale for using public procurement lies in the overall importance of demand-side activities to support innovation (Lundvall, 1988; Gregersen, 1992; Edquist, 2005). Demand-based innovation policy can be defined as “*a set of public measures to increase the demand for innovations, to improve the conditions for the uptake of innovations and/or to improve the articulation of demand to spur innovation and the diffusion of innovations*” (Edler, 2009: 3). Demand side activities focus on all the determinants that influence innovation processes from the side of the user. This influence emanates from organisations that may be either private or public. In this study, we will disregard the influence of private organisations (e.g. demanding customer firms or individual consumers) and only address the demand-side influence of public authorities, as this influence can assist in overcoming market and system failures that blur the relationship between demand and innovation.⁴

We have chosen the concept “Public Procurement for Innovation” (PPI) to denote the phenomenon at issue here. For the purpose of understanding, it is important to provide a definition of PPI, but even more so, to explain what this term does *not* include.

Public procurement for innovation (PPI) has in some studies been defined as the process by which “*a public agency places an order for a product or system which does not exist at the time, but which could (probably) be developed within a reasonable period*” (Edquist et al., 2000: 5). However, innovation can manifest in different forms and thus we extend it to purchasing activities carried out by a public agency that lead to innovation (Rolfstam, 2012). Consequently, R&D and innovation are needed before delivery can take place. In contrast to PPI, *regular procurement* occurs when public agencies buy ready-made products “off the shelf”, where no innovation is involved. Only the price and quality of the (existing) product are taken into consideration when the supplier is selected.

According to Edler and Georghiou (2007), when dealing with PPI, it is necessary to distinguish between general and strategic procurement. In the *general procurement* approach toward PPI, innovation is one of the essential criteria in the call for the tender and assessment of the tender documents.⁵ In the *strategic* approach to PPI, the public authority deliberately stimulates the development and market introduction of innovations by formulating new, demanding needs.⁶

In our view, innovation must be an *intended* outcome to be regarded as PPI (Uyarra and Flanagan, 2009). Other types of public procurement, just as other forms of policy, can lead to a range of different innovation related outcomes such as greater efficiencies in

production, incentives in capacity building, creation of lead-markets, enlarging the market for new goods, easing the adoption of new standards, changing the market structure, and even incentives to innovate, without innovation being the main objective (Cabral et al., 2006). This indicates that public procurement is not a stand-alone process but an additional instrument in the policy-mix (Flanagan et al., 2011).

In addition to the above-mentioned forms of PPI, we will also introduce a distinction in PPI between situations where the procuring agency is also the end-user of the product or system and situations where the procuring agency is not the end-user. In the ‘classic’ cases, the buying agency, such as the public electricity authority, the public hospital, the defence material buyer, or the state railway company, will use the procured product itself. It simply uses its own demand to influence or induce innovation. We call this ‘*direct*’ PPI. Alternatively, the agency may serve as a catalyst, coordinator and technical resource for the benefit of the end-users. We call this ‘*catalysing*’ (‘*or catalytic*’) PPI.⁷

In recent years a new form of procurement has also gained momentum in policy-making spheres, we are referring to Pre-Commercial Procurement (PCP). PCP concerns the Research and Development (R&D) phase before commercialisation” (European Commission, 2007a: 2).⁸. This type of intervention aims at reaching the stage of demonstrating feasibility or providing prototypes addressing social or agency needs/challenges. We will come back to this in Section 4 when the framework for organising public procurement in order to support innovation and entrepreneurship is introduced.

These different types of PPI can foster the development of innovative outcomes (i.e. goods, services and processes) in multiple ways (Rothwell, 1984; Geroski, 1990; Lember et al., 2011):

- creating new markets for products and systems that go beyond the state-of-the-art;⁹
- creating demand ‘pull’ by expressing the need for it to the industry in functional or performance terms;
- providing a testing-ground for innovative products; and
- providing a ‘lead market’ for new technologies.

Using PPI is, to a large extent, a matter of identifying human needs and societal problems that are not satisfied or solved at the present time. From a policy point of view, two kinds of needs/problems are particularly relevant:

- Those that cannot (easily) be articulated (transformed into effective demand) through the *market exchange signals* (supply/demand/price).

- Those that are articulated but cannot be satisfied/solved by (individual) private organisations. These *private organisations* are often firms.¹⁰

To have an economic impact, human needs must be transformed into or articulated as effective demand.¹¹ This transformation might or might not happen readily. If this transformation does not occur, there may be reason to consider innovation policy such as PPI as a mechanism to satisfy human needs. In these cases, it is assumed that the objective can be reached efficiently or effectively through innovation. The need/problem may also not be satisfied/solved without an element of innovation. A similar argumentation can be pursued with regard to societal problems.

The typical PPI process can be divided into the following stages (Edler et al., 2005; Expert Group Report, 2005):

1. Identification of a grand challenge (or a public agency/mission need), and its formulation in terms of a lack of satisfaction of a human need or an unsolved societal problem.
2. Translation of the identified challenge into functional specifications.
3. Tendering process:
 - a) Opening of the bidding process through a tender.
 - b) Translation of the functional specification into technical specifications by potential suppliers.
 - c) Submission of formal bids by potential suppliers.
4. Assessment of tenders and awarding of contracts.
5. Delivery process:
 - a) Product or service development.
 - b) Production of the product or service.
 - c) Final delivery to the purchasing agency.

This general structure does not infer that the PPI process is of a linear nature, as these general stages are interrelated (Edquist and Zabala-Iturriagoitia, 2012).

3. Public Procurement for Innovation and Knowledge-Intensive Entrepreneurship

This paper focuses on the relationship between PPI and entrepreneurship; in particular, Knowledge-Intensive Entrepreneurship (KIE). The goal is to identify how PPI can provide opportunities that lead to the creation of this form of entrepreneurship. The systems of innovation approach already shows some reflections on the link between

KIE and innovation (Radosevic and Yoruk, 2011). However, this link has not been explored in the literature on demand-based policies. Our paper contributes to progress in this direction. The overall issue this paper wants to address is whether the public sector can stimulate KIE through demand-side instruments in general and PPI in particular?

The needs discussed in the aforementioned section are often related to “large issues” or “grand challenges” (Lund declaration, 2009). Examples are found in the fields of health, energy, transportation, telecom equipment, the environment, sustainability, the military, and so on. The firms in these sectors may be established or may be new entrants created for the purpose of developing (parts of these) new products or systems. The latter can be related to the creation of KIE. Whether it is the former, the latter, or both depends largely on the call (Rothwell, 1984). Despite the broadness of these calls, the best practices studied in the literature highlight that large (mainly domestic) firms are the main beneficiaries of this type of policies. The cases studies reviewed in Edquist and Zabala-Iturriagoitia (2012) are a good example of this fact.

Due to the generally accepted economic and social importance of SMEs, also in terms of innovation, efforts have been undertaken to increase the participation of SMEs in procurement contracts. Nevertheless, the overall participation has been challenging for these firms, who face various barriers discouraging them to respond to, or even completely avoid, these opportunities (Karjalainen and Kemppainen, 2008; Piga and Treumer, 2012). Often mentioned barriers are related to the obtaining adequate information regarding the procurement procedures, the size of the contract and the overall task at hand, and general administrative burdens.

Various measures have been proposed and implemented in an attempt to lower these barriers (European Commission, 2008), which include sub-dividing contracts into lots, use of e-procurement and providing training to both procurement agencies and SMEs. However, further efforts to increase participation of SMEs are still required (DG Enterprise and Industry, 2010).

When discussing the role of PPI in relation to KIE, we do not, as most studies so far do, make a distinction based on size, but mainly on the age of the firm and the type of activities conducted. This is also highlighted by Malerba and McKelvey (2010: 2), who treat KIE as the underlying process by which “*new firms that are innovative, have a significant knowledge intensity in their activity and develop innovative opportunities in diverse sectors*” are created. We would like to stress the knowledge-intensity and the development of innovative opportunities in Malerba and McKelvey’s definition. In contrast to their definition, we do to take a broader perspective on entrepreneurial activities, which is defined as “*the enterprising human action in pursuit of the generation of value, through the creation or expansion of economic activity, by identifying and exploiting new products, processes or markets*” (Ahmad and Seymour 2008: 14), rather than to limit ourselves to (the creation of) new firms. This broader perspective on entrepreneurial activities still involves a process that translates

knowledge into innovation where knowledge can refer to scientific knowledge, technological knowledge and the application of knowledge (Malerba and McKelvey, 2010).

Although there are many studies that link public procurement to innovation (see Section 2), there are hardly any references that link public procurement (for innovation) to entrepreneurship. A potential explanation for why this link has not received academic attention might be that PPI is often addressed from a systems of innovation perspective, an approach that has largely neglected the notion of entrepreneurship (Radosevic, 2007).

On the one hand, PPI influences entrepreneurship by providing market opportunities, but also indirectly provides technological opportunities (Radosevic and Yoruk, 2011). By demanding products and systems that do not exist, the public authority indirectly demands the potential supplier to get involved in R&D and product development. Consequently, the public authority stimulates the overall knowledge creation in the system. The development of this knowledge can create new technological opportunities that provide incentives for the creation of KIE.

In light of PPI and KIE, we need to stress that the relationship between KIE and the goal of PPI (innovation) is not unidirectional, meaning that KIE leads to innovation but innovation can also lead to entrepreneurship. New technological developments also provide entrepreneurial opportunities that can be exploited by newly created firms. Thus, there are two ways in which PPI can be linked to KIE. First, PPI can be said to support those KIE activities that already exist by involving them in the procurement process. Second, PPI can eventually result in the establishment of new firms that possess all the features of KIE. Thus, we claim that PPI can stimulate KIE by providing entrepreneurial opportunities that can lead to the creation of new knowledge-intensive companies, which links to the KIE form as highlighted by Malerba and McKelvey (2010). However, these opportunities might not necessarily be exploited in the form of new firm creation, as indirect effects happen by virtue of the multiplier effects of public sector demand in the economy. In the context of how PPI can stimulate KIE, focusing on the creation of firms *per se* cannot, and most likely should not, be performed beforehand because this would depend on (i) how the entrepreneurial opportunities are recognised, and (ii) how the recogniser of the opportunity will act on these opportunities. In short, the creation of the firm is exogenous to the procurement process but the latter stimulates the entrepreneurial act.

Due to the cognitive act of recognising opportunities, individuals, not firms, identify these opportunities. The majority of these individuals are employed when they do so (Shane, 2003). Accordingly, it can be argued that the knowledge that is central to KIE will in most cases be closely related to the knowledge base of the organisation in which these individuals are employed. These organisations are not only private firms and public agencies but also academic environments (when focusing on academic

entrepreneurship), other knowledge centres, various communities of practice, etc. Whether these entrepreneurial activities will manifest as new firms, as diversification processes in existing firms, or as any other organizational form is dependent on a range of factors that lie outside the control of public authorities (Breschi et al., 2001).

To further develop the discussion, we need to differentiate between two scenarios. In scenario one, the KIE is already present before the launch of the PPI process. This means that the PPI has no impact on its emergence but acts as a supporting mechanism towards its continuation and potential growth trajectory. As this paper is interested in the emergence of the entrepreneurial act this typology of KIE will not be considered in much detail. This type of firm corresponds to a high degree to the above-mentioned SMEs, which also include micro-firms (i.e. firms with less than 10 employees). Thus, the barriers these firms face and the potential solution to lower them will be rather similar as to those by already established SMEs. It is also to be stressed that these firms will most likely suffer from those challenges related to the liability of newness (Stinchcombe, 1965), in particular, their legitimacy, and the perceptibility of entrepreneurs in dealing with public contracts (Shane, 2003). By approaching this typology of KIE and other existing firms, procurement agencies are limiting themselves to established private organizational forms, excluding other settings where the competences to address the social issues raised by the call may also exist.

The second scenario refers to a situation where the public procurement process leads to a mobilization of resources by those individuals that act on the (entrepreneurial) opportunity provided by the procurement agency, either by starting a new firm or any other organizational form. These activities can be initiated in a range of communities, varying from individuals in closed organizational settings (e.g. large private firms and publicly financed research centres) to open fora (e.g. communities of practice). Hence, when we refer to entrepreneurial activities, we mean that new firms (KIE) can be created not only by entrepreneurs but also by other agents within the innovation system. Again, the creation of a new firm might be a potential outcome, which is exogenous to the PPI process. The only criterion for the public sector is to find new contributions to solving the identified problem, regardless the type of organization that helps to solve it.¹² Thus, public agencies do not necessarily have to limit their scope to already existing firms but can broaden their search for the necessary competences to solve the grand challenge. By organizing the PPI in this way, the public sector takes a more open innovation approach to (social) problem solving (Chesbrough et al., 2011).

Already existing ways about organizing the public procurement process can contribute to support these entrepreneurial actions. These aspects, by which PPI can lead to the creation of KIE, together with their associated challenges, will be discussed in the following sections.

4. Organising Public Procurement for Innovation and Entrepreneurship

In Section 2, we discussed when public demand-side innovation policy could be pursued, i.e.: (i) if private organisations and the market exchange mechanism cannot automatically achieve the objectives, (ii) when it is a political objective to activate demand, and (iii) when the procurement has the potential to improve public services and infrastructure. In this section we will propose how the existing ways about organizing the public procurement process could provide opportunities to assist the emergence of KIE.

4.1. Coordinated unbundling

As indicated in Section 3, one of the main barriers faced by SMEs in procurement contracts is the large size of the contracts. Large contracts do *de facto* imply large difficulties for small parties to engage in the bidding due to their overall lack of resources. The European Commission has recently proposed a set of measures that could be implemented in order to overcome this problem (European Commission, 2008). One of these possibilities consists of dividing the contract into lots, what we will refer to as “coordinated unbundling”.

By creating bundled contracts, the (private) supplier will deliver a broad set of products and technologies, a strategy by which the public sector wants to ensure a sufficiently large market. This can provide the supplier with a potential demand that is large enough to recover the large investments made in developing the new product or system. In addition, firms can also benefit from economies of scale.

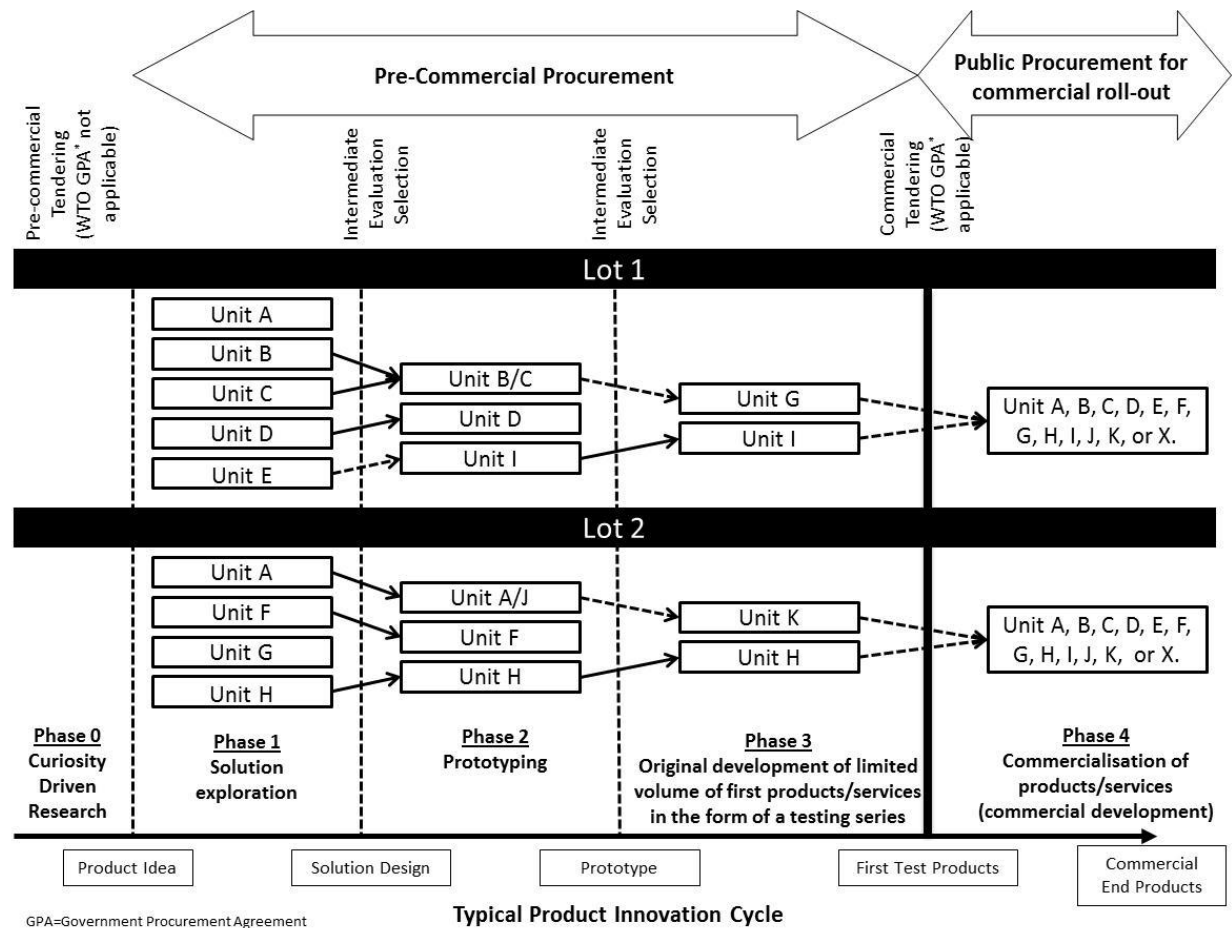
However, such bundled contracts have limitations in terms of firm participation. Smaller firms, including KIE, face difficulties in bidding on these bundled contracts because large firms have, in many cases, a stronger competitive advantage (European Commission, 2006a). This is a missed opportunity for creating innovation from ideas due to several reasons: (i) ideas are distributed among all type of firms and organizational forms; (ii) more participants create a greater diversity of research paths and increase the possibility of success; (iii) more participation increases the competitive pressure for incumbent firms, which cannot rest on past successes; (iv) the distance between leaders and followers can decrease, which positively affects the neck-and-neck competition (Cabral et al., 2006). By unbundling contracts the public sector can provide stimuli to smaller organizations to participate and thereby, indirectly, reserving spots for them in the procurement process (Karjalainen and Kemppainen, 2008).

Coordinated unbundling, whereby the larger market is preserved, but the development of various technologies is offered separately, is one strategy for increasing the participation rate of small firms. In addition, by coordinating this unbundling strategy a demand that is large enough to provide an incentive for larger firms to participate is retained (e.g. by aggregating the demand within the public sector, across sectors and/or

across borders) (Expert Group Report, 2005). It could also provide a way of entry for those individuals involved in the range of communities discussed under the second possible scenario (in Section 3). This unbundling can occur in two forms.

The first is what we call *vertical unbundling*. This type of unbundling shows similarities with the Pre-commercial Procurement concept (PCP) (see Section 2). The PCP process is illustrated in Figure 1, where the procurement process is divided into different phases, i.e.: curiosity driven research, solution exploration, prototyping, development of limited volume of first products, and commercialisation. We believe the strength of this PCP scheme is the clear divide on the allocation of resources between exploration and exploitation during the process of product innovation (March, 1991; Greve, 2007). Not all firms have the ability to allocate sufficient resources to both processes, and some firms might be better at generating ideas for new products, processes and systems, while others have an advantage in their implementation and diffusion. Furthermore, the number of actors who are able to generate new ideas is larger than the number of firms that have the capacity to implement and diffuse new products, new processes, and new systems (Dushnitsky and Klueter, 2011). Idea generation does not have to be limited to private firms but can be extended to larger communities, including the communities of potential future users, by providing an open call to all who can contribute to the idea generation process. This is similar to the principles of crowdsourcing (Howe, 2006), which have proven their success in fields such as mathematics and chemistry. Public authorities have the unique opportunity to match strong explorers with strong exploiters. In this regard, Figure 1 illustrates how a particular unit (represented by a firm or any other organizational form) can participate in one or more phases, but does not necessarily have to be active in the entire process. This means that handovers (e.g. technology and knowledge transfer) need to occur. In addition, it also allows for the entry of new units at any point in time, regardless their involvement in previous phases.

Figure 1.- Strategy for Coordinated unbundling by Pre-commercial procurement



Source: own adaptation based on European Commission (2006b, 2007a).

The second type of unbundling is what we call *horizontal unbundling*. In this unbundling strategy, the calls are divided into multiple products and technologies; firms can bid on one, several, or all of the lots that are described in the tender (Rothwell, 1984). Figure 1 is the example of one product or technology in a larger contract. Henceforth, a unit could potentially participate in multiple of these parallel processes described in the figure. From our point of view, this unbundling strategy allows the public sector to offer multiple points of knowledge-intensive and innovative entry.

4.2. Organising around coordinated unbundling

The public procurement process surrounding this coordinated unbundling follows the stages mentioned in the end of Section 2. The procurement process starts with the identification of the problem. The public sector might run into difficulties in the process of identifying needs and articulating them in such a way that it leads to the creation of innovations. It is, however, not only a matter of articulating demand for new products and processes but also matching this articulation with supply possibilities (i.e., the identification of new products and processes that can be developed to meet these demands). Both empirical knowledge and innovation theory strongly indicate that interactive learning between organisations is extremely important to the emergence of

innovations. This interactive learning can be activated in the PPI process by involving a diverse set of stakeholders in focus groups or technological platforms. The identification of the problem is a general activity in any public procurement process, so particularities in promoting KIE do not apply at this stage.

During this problem identification stage, policy-makers need to evaluate whether KIE is a socially desirable outcome (e.g. promoting entrepreneurial activities in order to foster structural change in an industry dominated by large players), and if so, whether coordinated unbundling is the preferred strategy given its particular cost structure (this and other challenges will be discussed in Section 5). It might be that the administrators do not possess the required information to make such a judgement, but given the involvement of a broad set of stakeholders in the problem identification, these same groups could cooperate with the public agency to assess this particular opportunity. This decision will also influence the way the call is formulated, in particular its functional specifications, which relates to the second stage in the PPI process.

How the public authority formulates these specifications will influence the likelihood of new product and system development and the possibility of KIE to emerge. An option may be to include the various stakeholders that are involved in the PPI process using their expertise to formulate functional specifications and not the product itself – not even its basic design. By providing only these functional requirements, potential suppliers are not limited in their creativity, and the emergence of innovative designs is stimulated.¹³ In addition to providing room for alternative solutions, there are other effects of demanding functional requirements. First, functional requirements provide more flexibility (i.e., the simultaneous procurement of more than one component/technology, or horizontal unbundling). Second, the competences for fulfilling the formulated requirements might be present in a wider set of organisations (i.e. vertical unbundling). This approach would provide room for the participation of (i) firms that are normally active in different product markets and (ii) other forms of organisations that have the competences to get involved. Consequently, this approach could lead to KIE and the diversification of existing firms.

One of the aspects to consider in the tendering process is the identification of potential suppliers, or “solvers”, that could provide a solution to the challenge posed in the call. These potential solvers may not all be reached by traditional communication channels. So, the public agency needs to evaluate which other channels are required to reach these potential participants. Possible channels could include both traditional instruments such as e-procurement or information centres (European Commission, 2008), and others like online fora for professional communities or open public competitions – which could include student competitions, creativity camps or even research funding as in the PCP approach - (Dushnitsky and Klueter, 2010).

The selection of proposals occurs within each of the phases identified in Figure 1. The selection criteria should be proportionate to the size (and complexity) of the

requirements set beforehand, and the stage of the process where the decision is being made. Thus, the value of each proposal will be subject to a two-way evaluation. The first is determined by the public procurer, while the second depends on whether the proposal can continue (either by the same unit who drafted the proposal, or by any other unit) into the next stage.¹⁴

5. Challenges in stimulating KIE through Public Procurement for Innovation

There are many obstacles and challenges associated with public procurement in general and PPI in particular. Some of them have already been addressed in the literature (Fernández Martin, 1996; Edquist and Hommen, 1999; Edquist et al., 2000; Edler et al., 2005). Here we will focus on some of the obstacles and challenges related to the promotion of KIE through the coordinated unbundling strategy. In this sense, there can be made a distinction between two sets of challenges; (i) those faced by the administrators regarding the management of the procurement process, and (ii) those faced by potential solvers in the decision to enter the process.

One of the most significant obstacles is the coordination of the entire process and the costs associated to it. Closely related to coordination obstacles is the issue of time. PPI is a time consuming process, so public authorities must realise that more efforts are needed to find innovative solutions than for regular forms of public procurement. The challenges related to coordination can be explained by the involvement of a broad range of actors. These actors are, in addition to the public authority, other public agencies (both national and international), users, experts, suppliers, and so on. The nature of unbundling might lead to an increase in the number of bids. This is related to the number of lots in which a procurement contract is divided and the higher number of potential solvers per lot. Accordingly, the evaluation of each of these bids and their eventual selection may become a bottleneck in the procurement process. For that reason, despite opportunities for KIE promotion, coordinated unbundling might not be the preferred strategy.

The lack of competences on the side of the public authority is a major obstacle for PPI in general (Edquist et al., 2000). It is very important to make the individuals and organisations that are involved in regular procurement more inclined to use their resources for innovative purposes and reduce their risk aversion (Tsipouri et al., 2010). There could be ample opportunities for the procurement of existing goods and services to be diverted to demanding non-existing products and services, where the element of innovation may lead to better results for the procurer in the long run in terms of needs satisfaction and solving societal problems. Accordingly, administrators in charge of public procurement processes may need to increase their training in innovation processes and entrepreneurship stimulation.

One major obstacle involves mobilising the “solvers”, which relates to the perceptibility they have (of their own competences) to participate in the process, the provision of the right incentives and helping them in trading with the public sector. Therefore, they are not able to channel their ideas and new developments to the government.

Perceptibility is mainly a challenge intrinsic to the individuals with the potential to participate in the process. However, the issue of perceptibility, and thus whether the entrepreneur is able to perceive the opportunity, is related to the cognitive processes of the individual (Share, 2003). Hence, there is only a limited role that the public procurement agencies can play. This constitutes a broader element, which relates to the entrepreneurial mindset.

Providing the right incentives can come in many different forms, mainly monetary (e.g. prize money or tax deductions). A prize system is challenging in that the value of the new good or service has to be verified, and determining the size of the monetary incentive is difficult to do beforehand in a situation in which the outcome is unknown (Cabral et al., 2006). Furthermore, in vertical unbundling there is a higher level of uncertainty in whether the ideas developed in the pre commercial stage can be commercialized. Second, the timing (a prize will be awarded after each phase or only when commercialization is reached) and the size (how much money will be awarded to the entire process and how much will be allocated to the various phases) of the award need to be considered. In this case, the public authority could set conditions or make agreements on licensing (or other award) mechanisms. This introduces the challenge of Intellectual Property Rights (IPR) (European Commission, 2007a). The allocation of IPR will impact the diffusion of the newly developed good/service/system to the market (Edler and Georghiou, 2007); however, it can also impact the continuity of the KIE that may emerge in the process.

The challenge of the information reach out was discussed in Section 4.2. Providing firms with the adequate information to trade with the public sector constitutes an information challenge that the public sector should address. Similar communication channels as mentioned in Section 4.2 could be applied in this case. Other measures could also include information campaigns or demonstration projects (Edler and Georghiou, 2007).

Finally, there is a challenge in relation to process of awarding contracts. Public agencies need to perform rigorous checks in order to these contracts what tends to reduce the chances of young firms to obtain the contract. The whole institutional set-up (as defined by the EU Directives) was once established in order to avoid problems related to fraud and saving tax-payers money and also to safeguard that the suppliers eventually selected would be able to deliver. A young firm without a CV might thus have problems in demonstrating its value in competition with incumbent firms.

6. Final remarks

This paper makes a theoretical contribution to the link between PPI and KIE. We can find in the literature, both theoretical and empirical, many examples about how public procurement processes provide support for innovation in existing, mainly large organizations. Recent discussions on the role of SMEs act as a logical conduit towards entrepreneurship, in particular that of knowledge-intensive and innovative character. However, the link between these two concepts is absent in the literature in both scholarly domains. It is important to emphasize that in this paper entrepreneurship does not only refer to the act of new venture creation, but it embraces a much broader concept of opportunity recognition (Shane and Venkataraman, 2000).

In order to cover the gap in the literature we introduce the concept of coordinated unbundling, which has a horizontal and vertical dimension. The horizontal unbundling divides the procurement contract into multiple lots. In turn, the vertical unbundling divides each lot into different phases of the product innovation cycle. This offers opportunities for smaller units to prepare a bid on one or a larger set of lots, where each of the phases offers room for new knowledge-intensive and innovative entry. However, there are clearly a set of challenges that need to be addressed in order to effectively implement this coordinated unbundling strategy. We acknowledge that there might also be other challenges related to the successful implementation of coordinated unbundling strategies besides those included in Section 5. With this contribution we just intend to provide a new conceptual framework to a field that has remained unexplored. Hence, further research needs to dig into the organizational implications that this unbundling strategy may have for public agencies in charge of procurement and entrepreneurial policies.

To conclude, the topic of PPI and KIE can have important social and economic consequences. On the one hand, it increases the interactive character of the innovation system and it might also influence its entrepreneurial mindset. On the other, it can also act as a catalyser for entrepreneurship in general and new venture creation in particular. The continuation of the entrepreneurial act, independent on its form, does not need to be a goal of the public procurement process, but it might be a desirable outcome in terms of innovation policy. Accordingly, procurement policies need to be included in a wider policy-mix (Flanagan et al., 2011), e.g. entrepreneurship or SME support policies.

Acknowledgements

A previous draft of this paper was presented at the DIME 2010 conference on “The emergence and growth of Knowledge Intensive Entrepreneurship in a comparative perspective. Studying various aspects in different contexts”, held in Athens (Greece) on April 29-30, 2010. The authors are indebted to the European Commission for the

funding provided to develop the AEGIS project (Advancing Knowledge-Intensive Entrepreneurship and Innovation for Economic Growth and Social Well-being in Europe), Grant agreement number 225134. We would like to thank Max Rolfstam and two anonymous referees for their constructive comments on a previous version.

References

Aho, E., Cornu, J., Georghiou, L. and Subira, A. 2006. Creating an Innovative Europe. Report of the Independent Expert Group on R&D and Innovation following the Hampton Court Summit and chaired by Mr. Esko Aho. Brussels 2006.

Ahmad, N. and Seymour, R. G. 2008. Defining entrepreneurial activity. Definitions supporting frameworks for data collection. OECD Statistics Working Papers 2008/01 . OECD, Paris

Breschi, S., Malerba, F. and Orsenigo, L. 2001. Technological Regimes and Schumpeterian Patterns of Innovation. *The Economic Journal*, **110**, 388-410.

Brutscher, P.B., Cave, J. and Grant, J. 2009. Innovation Procurement. Part of the Solution. Prepared as part of RAND Europe's Health Research System Observatory, funded by the Department of Health (England). RAND Europe.

Cabral, L., G. Cozzi, V. Denicoló, G. Spagnolo and Zanza, Z. 2006. Procuring Innovations. In *Handbook of Procurement*, eds. N. Dimitri, G. Piga and G. Spagnolo, pp. 483–528. Cambridge: Cambridge University Press.

Chesbrough, H., Vanhaverbeke, W., Bakici, T. and Lopez-Vega, H. 2011. Open Innovation and Public Policy in Europe. ESADE Business School. Science Business Publishing Ltd.

Dalpé, R., DeBresson, C. and Xiaoping, H. 1992. The public sector as first user of innovations. *Research Policy*, **21**, 251-263.

DG Enterprise and Industry. 2010. Evaluation of SMEs' access to public procurement markets in the EU. DG Enterprise and Industry. September 2010.

Dushnitsky, G. and Klueter, T. 2011. Is there an eBay for Ideas? Insights from Online Knowledge Marketplaces. *European Management Review*, **8**, 17-32.

Edler, J. 2009. Demand Policies for Innovation in EU CEE Countries. Manchester Business School Working Paper No 579, The University of Manchester.

Edler, J. and Georghiou, L. 2007. Public Procurement and Innovation – Resurrecting the Demand Side. *Research Policy*, **36**, 949-963.

Edler, J., Ruhland, S., Hafner, S., Rigby, J., Georghiou, L., Hommen, L., Rolfstam, M., Edquist, C., Tsipouri, L., Papadakou, M., 2005. Innovation and Public Procurement.

Review of Issues at Stake. Study for the European Commission (No ENTR/03/24). Fraunhofer Institute Systems and Innovation Research. December 2005.

Edquist, C. 2005. Systems of Innovation: Perspectives and Challenges. In *The Oxford Handbook of Innovation*, eds. J. Fagerberg, D.C. Mowery and R.R. Nelson, pp. 181-208. Oxford: Oxford University Press.

Edquist, C. and Hommen, L. 1999. Systems of Innovation: theory and policy from the demand side. *Technology in Society*, **21**, 63–79.

Edquist C., Hommen, L. and Tsipouri, L. 2000. *Public Technology Procurement and Innovation*. Boston/Dordrecht/London: Kluwer Academic Publishers.

Edquist, C. and Zabala-Iturriagagoitia, J.M. 2012. Public Procurement for Innovation as Mission-oriented Innovation Policy. *Research Policy*, **41** (10), 1757-1769.

European Commission. 2000. The European Observatory for SMEs, Sixth Report.

European Commission. 2006a. Pre-commercial Procurement. A missing link in the European innovation cycle. European Commission, March 2006.

European Commission. 2006b. Pre-commercial Procurement. Public sector needs as a driver of innovation. European Commission, September 2006.

European Commission. 2007a. Pre-commercial Procurement: Driving innovation to ensure sustainable high quality public services in Europe. SEC(2007) 1668. Brussels, December 2007.

European Commission. 2007b. Guide to Dealing with Innovative Solutions in Public Procurement. 10 Elements of Good Practice. Commission staff working paper SEC (2007) 280 Brussels.

European Commission. 2008. European code of best practices facilitating access by SMEs to public procurement contracts. Commission of the European Communities. SEC(2008) 2193.

European Council. 2006. Brussels European Council 23/24 March 2006, Presidency Conclusions. Brussels. 18 May 2006.

Expert Group Report. 2005. Public Procurement for Research and Innovation. Developing procurement practices favourable to R&D and innovation. DG Research, European Commission. EUR 21793 EN, September 2005.

Fernández Martin, J.M. 1996. *The EU Public Procurement Rules: A critical Analysis*. Oxford: Clarendon Press.

- Finland's EU Presidency. 2006. Demand as a Driver of Innovation – Towards a more European Innovation Policy. Discussion Note to the Informal Meeting of the Competitiveness Ministers, Finland, July 10-11, 2006.
- Flanagan, K., Uyarra, E. and Laranja, M. 2011. Reconceptualising the 'policy mix' for innovation. *Research Policy*, **40**(5), 702-713.
- Geroski, P.A. 1990. Innovation, Technological Opportunity, and Market Structure. *Oxford Economic Papers*, **42**, 586–602.
- Gregersen, B. 1992. The Public Sector as a Pacer in National Systems of Innovation. In *National Systems of Innovation - Towards a Theory of Innovation and Interactive Learning*, ed. B.Å. Lundvall, pp. 129–145. London: Pinter.
- Greve, H.R. 2007. Exploration and Exploitation in Product Innovation. *Industrial and Corporate Change*, **16**(5), 945-975.
- Hommen, L. and Rolfstam, M. 2009. Public Procurement and Innovation: towards a taxonomy. *Journal of Public Procurement*, **9**(1), 17-56.
- Howe, J. 2006. The Rise of Crowdsourcing. *Wired*, **14**(6), June 2006.
- Kalvet, T. and Lember, V. 2010. Risk management in public procurement for innovation: the case of Nordic–Baltic Sea cities. *Innovation - The European Journal of Social Science Research*, **23**(3), 241-262.
- Karjalainen, K. and Kempainen, K. 2008. The involvement of small- and medium-sized enterprises in public procurement: Impact or resource perceptions, electronic systems and enterprise size. *Journal of Purchasing & Supply Management*, **14**, 230-240.
- Kattel, R. and Lember, V. 2010. Public Procurement as an Industrial Policy Tool: an option for developing countries? *Journal of Public Procurement*, **10**(3), 368-404.
- Lawther, W.C. and Martin, L.L. 2005. Innovative practices in public procurement partnerships: The case of the United States. *Journal of Purchasing & Supply Management*, **11**, 212–220.
- Lember, V., Kalvet, T. and Kattel, R. 2011. Urban Competitiveness and Public Procurement for Innovation. *Urban Studies*, **48**(7), 1373-1395.
- Lund declaration. 2009. Europe must focus on the grand challenges of our time. Lund declaration, July 2009.
- Lundvall, B-Å. 1988. Innovation as an interactive process: From User-Producer Interaction to the National Innovation Systems. In *Technical Change and Economic Theory*, eds G. Dosi, C. Freeman, R.R. Nelson, G. Silverberg and L. Soete. London: Pinter Publishers.

- Malerba, F. and McKelvey, M. 2010. Conceptualizing Knowledge Intensive Entrepreneurship: Concepts and Models. Presentation AEGIS plenary meeting Lisbon, 27 October 2010.
- March, J. 1991. Exploration and Exploitation in Organizational Learning. *Organization Science*, **2**, 71-87.
- Neij, L. 2001. Methods of evaluating market transformation programmes: experience in Sweden. *Energy Policy*, **29**, 67-79.
- OECD. 2011. *Demand side innovation policies*. OECD Publishing.
- Piga, G. and Treumer, S. 2012. *The Applied Law and Economics of Public Procurement*. London: Routledge.
- PRO-INNO. 2007. Exploratory Team Report-Towards Innovative Public Procurement. 3 May 2007, PRO-INNO Europe.
- Radosevic, S. 2007. National Systems of Innovation and Entrepreneurship: In Search of a Missing Link. Economics Working Paper No. 73. UCL-SSEES, Centre for the Study of Economic and Social Change in Europe. UCL School of Slavonic and East European Studies.
- Radosevic, S., Yoruk, E. 2011. Entrepreneurial Propensity of Innovation Systems. Economics Working Paper No.117, University College London, School of Slavonic and East European Studies, January 2012. Paper available at: http://www.ssees.ucl.ac.uk/publications/working_papers/wp117.pdf (last time checked August 2012).
- Rolfstam, M. 2007. The Utilities Directive and How it Might Affect Innovation: The Case of Innovative Procurement of Maritime Radio Technology. *Public Procurement Law Review*, **6**, 435-460.
- Rolfstam, M. 2009. Public procurement as an innovation policy tool: the role of institutions. *Science and Public Policy*, **36**(5), 349-360.
- Rolfstam, M, forthcoming. An Institutional Approach to Research on Public Procurement of Innovation. *Innovation - The European Journal of Social Science Research*, in press.
- Rolfstam, M., Phillips, W. and Bakker, E. 2011. Public procurement of innovations, diffusion and endogenous institutions. *International Journal of Public Sector Management*, **24**(5), 452-468.
- Rothwell, R. 1984. Creating a regional innovation-oriented infrastructure: the role of public procurement. *Annals of Public and Cooperative Economics*, **55**(2), 159-172.

Rothwell, R and Zegveld, W. 1981 *Industrial Innovation and Public Policy: Preparing for the 1980s and the 1990s*. London: Pinter Publishers.

Shane, S.A. 2003. *A General Theory of Entrepreneurship: The Individual-Opportunity Nexus*. Cheltenham: Edward Elgar Publishing.

Shane, S. and Venkataraman, S. 2000. The Promise of Entrepreneurship as a Field of Research. *Academy of Management Review*, **25**(1), 217-226.

Stinchcombe, A.L. 1965. Social Structure and Organizations. In J. G. March (Ed.), *Handbook of Organizations*: 142–193. Chicago: Rand McNally.

Tsipouri, L., Edler, J., Rolfstam, M. and Uyarra, E. 2010. Risk management in the procurement of innovation. Concepts and empirical evidence in the European Union. The EC Expert Group of Public Procurement and Risk Management.

Uyarra, E. and Flanagan, K. 2009. Understanding the innovation impacts of public procurement. *European Planning Studies*, **18**(1), 123-143.

¹ During recent years, procurement policies have increasingly appeared on policy agendas. The report written by the Aho group, which was presented to the European leaders at their spring summit in 2006, mentioned that demand-side initiatives and procurement were important initiatives for supporting innovation (Aho et al., 2006). This report, backed by the EU Council in spring 2006, called for the support of markets for innovative goods and services, including public procurement (European Council, 2006). During the Finnish Presidency, a ministerial meeting was organised in Lahti, where a paper entitled “Demand as a Driver of Innovation – towards a More Effective European Innovation Policy” was presented (Finland’s Presidency, 2006). In addition, a Commission Handbook on Public Procurement for Innovation was published in 2007 (European Commission, 2007a). More recently, the debate has been directed towards “Pre-Competitive Procurement” (European Commission, 2006a, 2006b, 2007b).

² When the acronym PPI is used in the paper, “Public procurement as an innovation policy tool” is intended (Rolfstam, 2009; Kattel and Lember, 2010).

³ Entrepreneurial activity is defined as “the enterprising human action in pursuit of the generation of value, through the creation or expansion of economic activity, by identifying and exploiting new products, processes or markets” (Ahmad and Seymour 2008: 14).

⁴ The rationale for public intervention in the form of demand-side innovation policies can be explained by the various market and system failures that are present at the intersection between demand and innovation (i.e., structural hindrances that hamper the market introduction and diffusion on the demand side as well as the transformation of needs into market signals) (Dalpé et al., 1992; Edler, 2009; OECD, 2011). Known failures exist because (i) first users bear higher entry, (ii) users do not recognise the potential of innovative products and services and thereby create an insufficient demand or no demand at all, (iii) first users have high adjustment and learning costs, (iv) users are locked into existing technologies, and breaking out of these technological trajectories is costly and demanding and requires strong incentives, (v) during the early phase, there are hardly any network effects due to the low number of users, (vi) users are not able to articulate and signal their needs to the manufacturers, and (vii) there is an inability to recognise a demand but an inability to translate the demand into innovative products and services. The presence of these failures provides a potential for public policy intervention that can improve the overall level of welfare. Overcoming these failures is not the only motive for public intervention. Edler and Georghiou (2007) identify two additional motives. First, there is a clear political objective for activating demand, such as an economic objective to stimulate growth and strengthen competitiveness, to reach societal goals, and to create lead-markets. Second, the purchase of innovative solutions can offer a strong potential for improving public services and infrastructure.

⁵ To incorporate such an innovation criterion, PPI administrators should consider using the Most Economically Advantageous Tender (MEAT) as the primary option for selection and awarding criteria.

This framework can include, in addition to innovation, other criteria such as price, quality, delivery dates, technical merit, and so on. (Expert Group Report, 2005).

⁶ Edler and Georghiou (2007) also state that a strategic approach includes the demand of an already existing innovation to accelerate the market introduction, and particularly, the diffusion. We recognise that public procurement is an important mechanism for diffusing already existing innovations, but this strategic approach does not fit our definition of PPI, as it involves an already existing product.

⁷ Other typologies are also offered by Edquist et al. (2000), Hommen and Rolfstam (2009), and Edler (2009).

⁸ This particular instrument finds its rationale in the failures that arise in public goods and services, as the market incentive (for suppliers) to satisfy the needs of private customers is higher than for public sector customers (European Commission, 2006a).

⁹ By products and systems we mean new goods, services and the combination of the two, which might be called a system. Thus, we do not intend to exclude procurement of services (and thus service innovation).

¹⁰ The combination of 'market exchange signals' and 'private organisations' are often called "the market" in economic language. Here, we are making a distinction between them.

¹¹ A need is not the same thing as effective demand. A need is latent demand, which has to be translated or articulated into effective demand to matter in a market economy.

¹² With this organization, the public sector may also foster an increasing interaction among the actors of an innovation system, which is one its main functions.

¹³ When adopting such a functional requirement approach, public authorities might need to specify standards, for example ensuring compatibility, providing regulation, etc. (Edler and Georghiou, 2007; Cabral et al., 2006).

¹⁴ For example, if a proposal formulated within phase 1 (solution exploration) is accepted by the public procurer, then, this proposal will only have value when a prototype (phase 2) can be developed, either by the same unit who drafted it, by another unit, or a combination of those two.