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D3.3
'Roadmap for the pre-commercial procurement of ICT-based fall prevention and effective intervention solutions for elderly people'

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[1] R = Report, P = Prototype, D = Demonstrator, O = Other
[2] PU = Public, PP = Restricted to other programme participants (including the Commission Services), RE= Restricted to a group specified by the consortium (including the Commission Services), CO = Confidential, only for members of the consortium (including the Commission Services)

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21	20/01/2016	TICS	Final review and harmonisation	Margarita Hospedales Jesús Berdún
22	03/02/2016	UPC	Final approval	Andreu Català

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Glossary

EC	European Commission
EU	European Union
PCP	Pre-Commercial Procurement
PPI	Public procurement of innovation
FCP	Forward Commitment Procurement
FP7	Seventh Framework programme
SME	Small and Medium Enterprises
IPR	Intellectual Property Rights
R&D	Research and Development
ICT	Information and Communications Technology
OECD	Organization for Economic Co-operation and Development
GDP	Gross Domestic Product
H2020	Horizon 2020

1. Introduction

Each year, one in three people over the age of 65 has a serious fall, most commonly in their own home [4]. In the recent years, ICT technologies have showed their potential to enhance the autonomy and quality of life of elderly people, through improved detection and/or prevention of elderly falls [5].

ICT for Fall prevention aims to address the problem of falls that could affect mainly elderly people, who are the end users, and for this reason accessibility is essential. There are three prerequisites of the public procurement for accessible ICTs. Firstly, to offer a usable design. The solution must have good usability characteristics built into the mainstream product and services, preferably at inception. Secondly, the availability. The products and services developed must be available and offered to end-users. Finally, affordability. The price point to access the products and services cannot be prohibitive [3].

This roadmap aims to become a practical guide to help public procurers, companies and other stakeholders involved in the "*ICT for Falls*" value chain, to recognize the PCP (Pre-commercial Public Procurement) process as a tool to achieve solutions for society real needs, attaining their companies and institutions objectives.

The main outcome is represented by two different documents: The first one, that is this pre-final document, identifies and describes the key steps and phases to prepare and run a PCP process, offering complementary information related to each point. This first document contains the baseline information used to develop the second document, that presents the main ideas with a framed visual effect aiming to introduce all different stakeholders of the innovation chain in ICT for Falls (ICT4Falls) in the concepts and steps related to the Procurement of Innovation. This second outcome, which will be used for a broader distribution, is included as ANNEX IV.

This document is based on the three following points:

- **Describe the different procurement processes for innovation (PCP and PPI).** It is important to understand both the differences and commonalities that exist in PCP and PPI processes and to apply each one in the right conditions.
- **Define the PCP/PPI roadmap** (key steps and phases) from preparation to implementation. PCP and PPI processes have to follow several steps to become successful cases. Without a good roadmap definition, some important details can be overlooked.

- **Identify the tools and methodologies to support PCP/PPI deployment.** Some successful PCP and PPI cases are explained step by step as examples of good practices. Many tools are provided to the reader of the document to ensure the good deployment of the PCP or the PPI process.

1.1 Methodology

1a. We have analyzed the information provided in previous deliverables in WP3:

- D3.1 – "Inventory of good practices in a White Paper"
- D3.2.1 and 3.2.2 - "Success factors to strengthen the procurement process of ICT-based fall prevention and effective intervention solutions for elderly people".

1b. we have also continued with the task to contact different experts and to identify new projects and initiatives related to the procurement of innovation in the ICT for Falls field.

2. From the different sources, we extracted the more relevant information with the aim to reach the audience with a more direct message. This information were compiled in a final document D3.3, "Roadmap for the pre-commercial procurement of ICT-based fall prevention and effective intervention solutions for elderly people", final version, landing the usually complex concepts about Procurement of Innovation and showing them in a very visual and easy-to-read way.

3. Revision from the experts: We directly ask some experts in Procurement of Innovation to review D3.3 Final version. They contributed with their own experiences and point of views in improving this roadmap to be a useful tool for those who want an initial point of reference about the Procurement of Innovation Process.

Analysis of D3.2.1and D3.2.2 and literature review about the public procurement process

(to identify new success cases)

DIRECT INQUIRIES to procurement experts

Dissemination of the roadmap

Expected result: increased awareness among all stakeholders involved in the "*ICT for Falls*" ecosystem and that therefore could potentially launch or participate in a PCP process to create step-change innovations in this field.

2. Innovation procurement

Public procurement is the process whereby public authorities - including all levels of government and public agencies - buy goods and services or commission work. The resulting contracts make up a very significant proportion of the European Union market, accounting for about 19% of its gross domestic product (GDP) or almost €2.400 billion a year [6].

Over the last decade the **Public and Private Procurement** in the innovation process has evolved from initially being a matter attracting only scattered attention (mainly in academic circles) to the current state where few would question the idea of using public procurement as a demand-side innovation policy instrument [6]. The Organization for Economic Co-operation and Development (OECD), for instance, has established that "public procurement is at center of recent demand-side innovation policy initiatives. Because of their large purchasing power, governments can pull demand for innovation and can also create a signaling effect as lead user and influencing the diffusion of innovation broadly".

Moreover, one of the stated objectives of the reform of the EU Procurement Directives is to promote innovation. The purchase of innovative goods and services by public authorities is frequently cited as a means of improving Europe's economic competitiveness while helping to solve social and environmental problems or deliver public services in new, more efficient ways [7]. Therefore, **Innovative Partnerships** is the framework that enables the contracting authorities to push industrial R&D to its needs and foster innovation in the public sector. [9]

2.1.1 Why public procurement is important for innovation?

Public procurement plays an important role in the overall economic performance of the European Union [11]. Public procurement accounts for some 19% of gross domestic product (GDP) in the EU and offers an enormous potential market for innovative products and services. At the same time there is a "market failure". On one hand, the demand is not able to encourage the market to answer to its needs: it is not giving the right signals. On the other hand, the offer is not known. Moreover, in a time of severe economic, social and environmental crisis, entrepreneurs and investors are more exposed to risk taking. This makes it even harder to develop new markets and to support innovation transfers. That is where the power of public purchasing has to play a role [12].

Improved public procurement practices can help to foster market uptake of innovative products and services. At the same time these practices will raise the quality of public services in markets where the public sector is a significant purchaser. Public authorities should act as "launch customers" by promoting the use of innovation-friendly procurement practices. Member States are encouraged to take specific measures to stimulate innovation and research through improved public procurement practices. That requires changes in the administrative processes typically used by national, regional and local public procurement offices in preparing calls for tenders.

The Europe 2020 flagship initiative Innovation Union underlines the importance of Public Procurement of Innovation: "*From 2011, Member States and regions should set aside dedicated budgets for pre-commercial procurements and public procurements of innovative products and services. This should create procurement markets across the EU starting from at least €10 billion a year for innovations that improve the efficiency and quality of public services, while addressing the major societal challenges. The aim should be to achieve innovative procurement markets equivalent to those in the US. The European Commission will provide guidance and set up a (financial) support mechanism to help contracting authorities to implement these procurements in a non-discriminatory and open manner, to pool demand, to draw up common specifications, and to promote SME access.*"

2.1.2 PCP – Pre-Commercial Procurement

At present, the globe is experiencing challenges in many sectors ranging from economic, social and demographic changes compounded by aging populations, economic downturns and climate change. These challenges lead to investment constraints and addressing these issues requires new and innovative solutions. **One strategy for encouraging the development of new products or solutions is to contract research and development services by the Pre-commercial procurement (PCP).** It permits to finance research and development directly using open calls to distribute grants in competition.

The PCP approach within the public procurement of innovation, address specifically the procurement of research and development (R&D) services rather than actual goods and services; if the goods or services developed during the research and development phase are to be procured, this would need to be based on a separate procurement process.

PCP can be used if there are no near-to-the-market solutions and new research and development is needed. PCP can then compare the pros and cons of alternative competing solutions approaches and de-risk the most promising innovations step-by-step via solution design, prototyping, development and first product testing.

PCP includes the following significant features [13]:

1. Sharing the risks and the benefits as required by the market current situation
2. Benefiting from a phased competitive development
3. Differentiating between the R&D and the commercial deployment stages

PCP induces a win-win for suppliers and procurers. If a pre-commercial public procurement is conducted, citizens and policy markets can also benefit [14], [53]. Examples of winning stakeholders can be seen in Figure 1. Win-win for all stakeholders [14]:

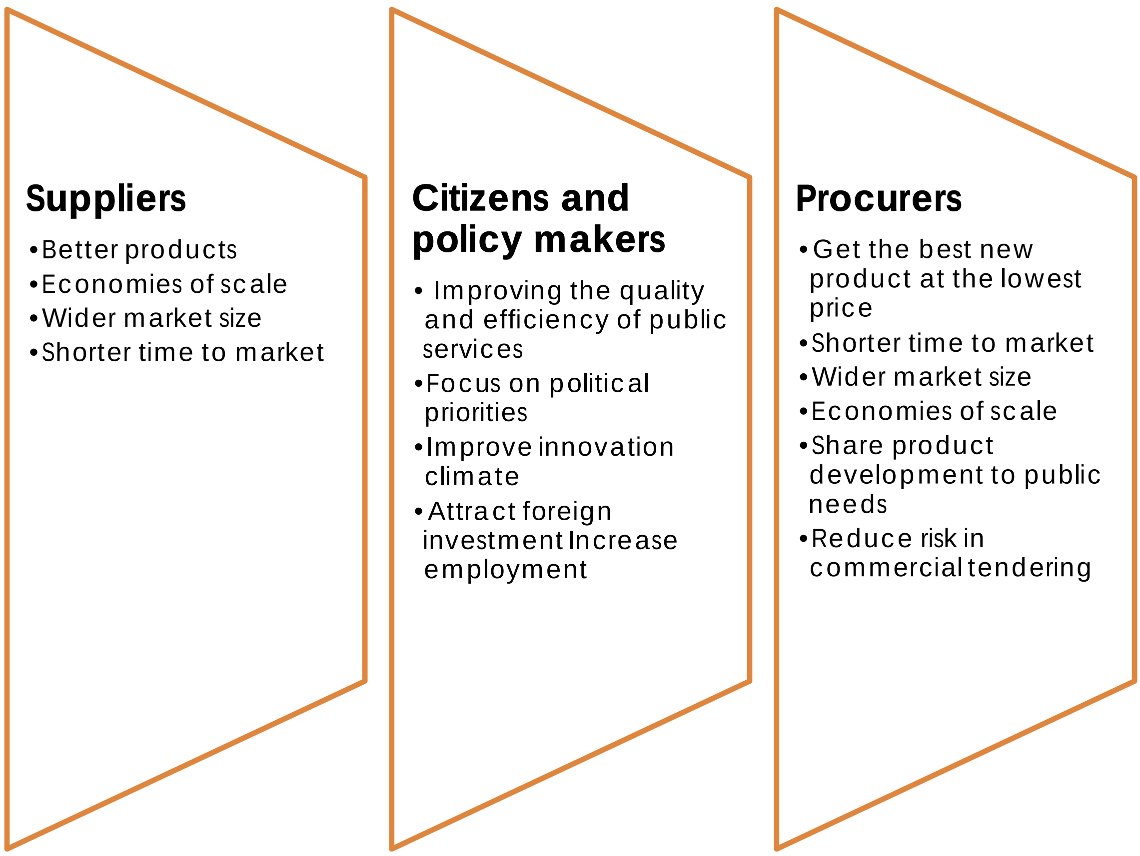

Figure 1. Win-win for all stakeholders [14], [53]

2.1.2.1 Analysis of European business cases in applying PCP

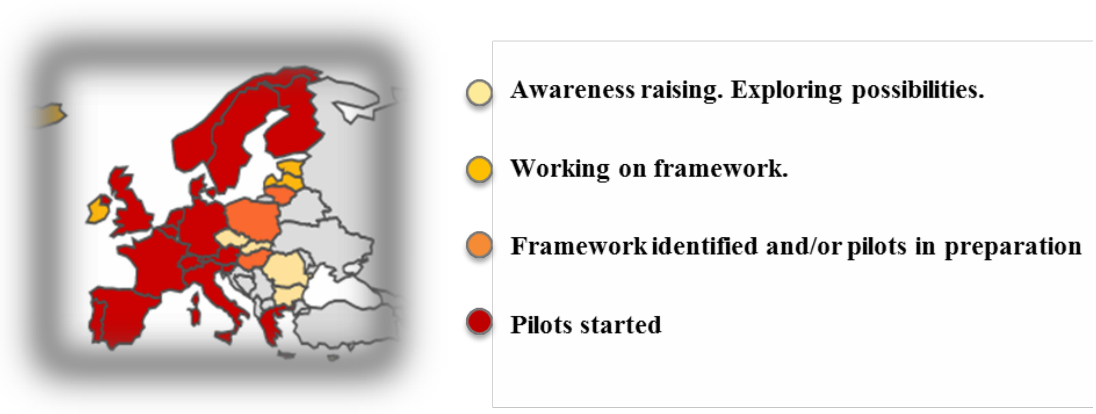

Figure 2. Overview picture of implementation of PCP in Europe [15]

A set of 22 business cases of PCP application have been identified in Europe [15] [16] in which 21 European countries have been involved, working alone or as part of a consortium with other countries (table with the characteristics of each one can be seen in "Annex I: Set of PCP cases"). The first case identified started in 1997 in Denmark and it was about care social management. According to the data collected, since 2009 onwards PCP activity has greatly increased across all Europe.

Based on the 22 cases studied, the most common sector that uses the PCP process to find innovative solutions to specific needs is healthcare (55% of the projects studied are related to health issues) (Fig. 4 PCP cases identified by sector). Secondly, the mobility sector seems also interested to use PCP as a tool to solve problems using solutions that are not yet in the marketplace (18% of the projects). To a lesser extent, projects related to energy-efficiency and data transfer have been found (9% of the projects are related to each topic). Finally, one project is related to education and the last one to personal protection. In Figure 3 can be seen the PCP health cases identified by ambit. The graphic shows that the most common health ambits that use PCP process to provide innovative solutions are elderly healthcare ITC for health. It can be explained because two main keys for the health system are the elderly healthcare and the application of new technologies to solve daily problems. In the ambit of the elderly care, the health system promotes a non-dependent elderly which is possible through the prevention (e.g. prevention of falls) and the care of sick elderly. Moreover, the technology is the driving force that moves the health system. Thus, lots of PCP procedures are related to ICT applied in health.

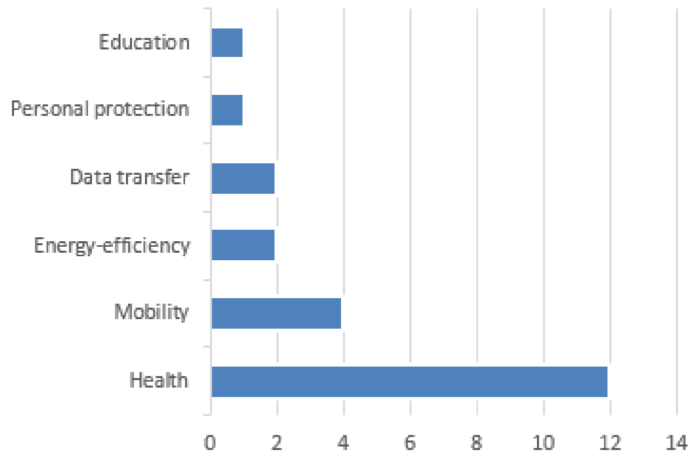

Figure 4. PCP cases identified by sector [15] [16]

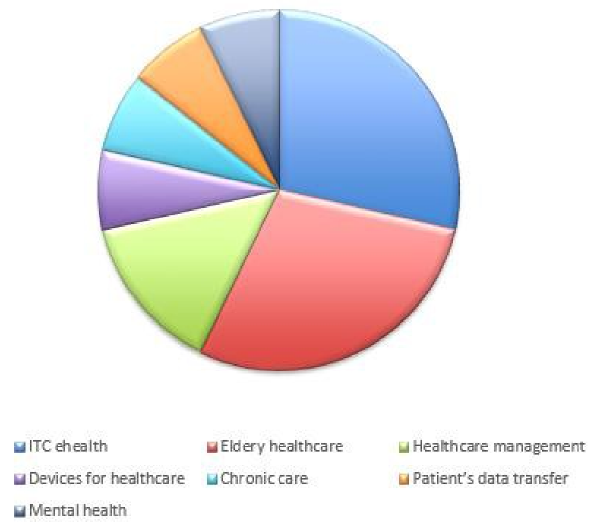

Figure 3. PCP health cases identified by ambit

2.1.3 PPI – Public Procurement of Innovative Solutions

Currently, many challenges facing society require innovative solutions. Some of these products or services are not possible to find on a large scale on the market but newly arriving on the market. For this reason, it has been necessary to find out new market options to tackle key societal challenges. That's when Public Procurement of Innovative Solution takes place, bringing the possibility to provide more efficiently and effectively and also more cheaply services to the users.

The Public Procurement of Innovative Solutions (PPI) is the public procurement from goods or services that newly arriving on the market. The contracting authority acts as a first buyer of innovative commercial end-solutions newly arriving on the market that are not widely commercially available but have already been technically demonstrated with success. These goods or services must respond to specific problems from the contracting authority.

There's a complementation between PPI and PCP (Figure 6. Pre-commercial Procurement (PCP) and Public Procurement of Innovative Solutions (PPI) processes [8]6). While PCPs are started with a good or service that are not possible to find in the market, PPIs are started in cases that are closer to the market. Thus, PCP and PPI must be used in different situations. PPI can be promoted when no R&D is needed to satisfy the procurer's innovation needs. Moreover, when the first end-products from an industrial R&D are nearly on the market but they are not closer to the mass market deployment yet. These products could have progressed up via a PCP or not [21].

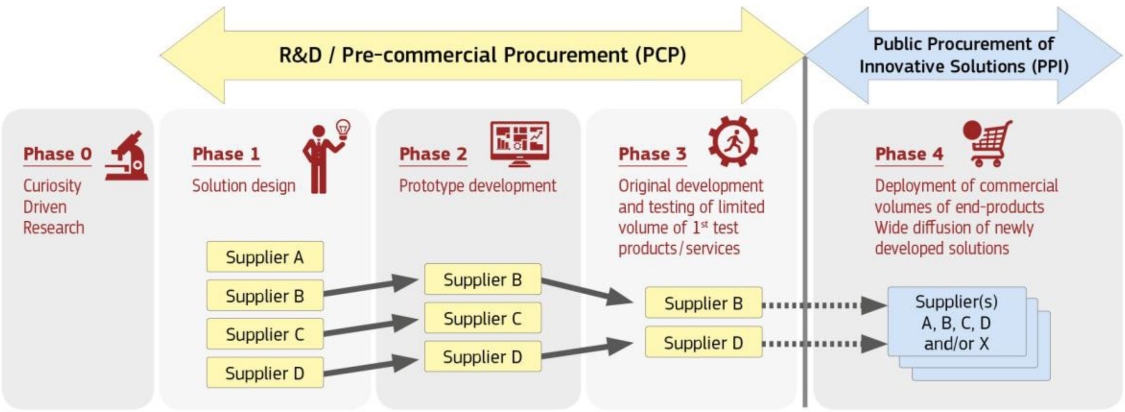

Figure 6. Pre-commercial Procurement (PCP) and Public Procurement of Innovative Solutions (PPI) processes [8]

In 2013, the EC opened a call for proposal to con-finance consortia of procurers for deploying innovative ICT solutions in the areas of ICT for health and ageing well under Call 7 of the ICT part of the 2013 CIP program: CIP-PSP-2013-7. The same call also supported networking of procurers that want to prepare future PPIs in the areas of smart sustainability mobility and resource efficient data servers for smart cities. The Commission's proposal for the 2014-2020 EC research and innovation support program, Horizon 2020, foresees the continuation of similar

EC grants that co-finance the costs for consortia of public procurers from minimum three different Member States and/or Associated Countries to undertake together a PCP or PPI [22].

Public Procurement of Innovative Solutions (PPI) has been recently defined as "the purchase of new or significant improved goods and/or services, processes, etc. that are new to the public procurer and new in the Internal Market" [9]. In a PPI procurement the contracting authority acts as "launching costumer", that is the first customer to acquire newly developed commercially viable end-products for deployment. [10] So PPI is related to short to mid-term needs and more incremental type innovations.

Public Procurement of Innovative solutions (PPI) can be used when challenges can be addressed by innovative solutions that are nearly or already in small quantity on the market and don't need new R&D.

2.1.3.1 Analysis of European business cases in applying PPI

In 2011, the European Commission published a call for proposals to support PPI. This call resulted in the performance of some pilot projects [23]. The 10 business cases selected can be seen in Annex II.

14 countries have been involved in the 10 studied projects, working alone or in a consortium with other countries. According to the 10 cases studied, the most common sector that uses PPI process to find innovative solutions to specific needs is the energy-efficiency sector (45% of the projects studied are related to mobility issues) Secondly, the health sector seems also interested to use PPI as a tool to solve problems using solutions that exist in the market but that doesn't penetrated in it yet (27% of the projects). At the same level of the health sector, projects related to mobility seems also interested to PPI processes (27 % of the projects).

In Figure 5 can be seen the PPI health cases identified by ambit. The graphic shows that elderly healthcare, devices for healthcare and healthcare management use equally PPI process to provide innovative solutions. It is in line with the PCP studied cases and it can be explained because these are some of the main keys to be solved in the health system. These key points are summarized in Figure 6.

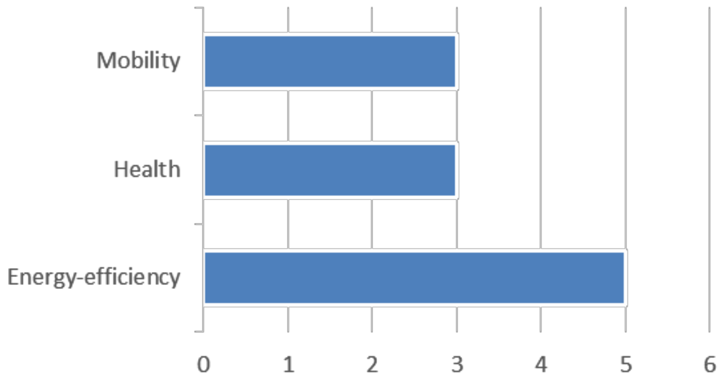

Figure 4: PPI cases identified by sector [23]

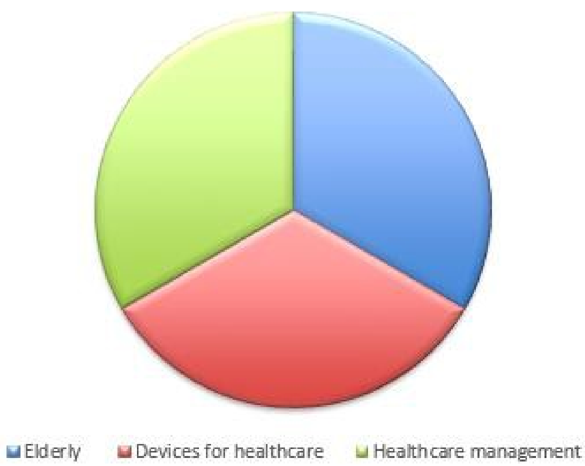

Figure 5: PPI cases identified by ambit [23]

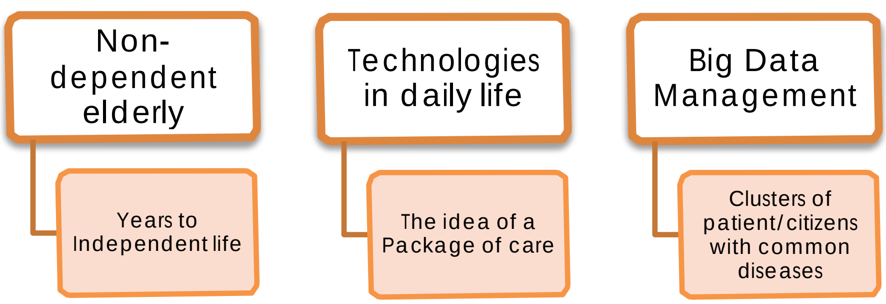

Figure 6: Key points of the most common ambits in health applying PCP and PPI

3. Why to be involved in a PCP process?

Given the socio-economic challenges ahead, the public sector in Europe is confronted with huge transformation challenges so as to ensure sustainability of the European societal model. There is a real need for the European public sector to innovate the way public services are operated. Furthermore there is pressure to provide new value added services, particularly in light of the challenge of the ageing population and the growing need of related services. Addressing these challenges requires the public sector to invest in new technologies and to be partner of the industrial component of the society and in cooperation with the innovation agencies (universities, research centers, etc.).

A transformation is required and can be facilitated by the Pre-Commercial Procurement Process, which relies on maturing and successfully deploying new technologically innovative solutions that can enable improved delivery of public services at reasonable cost. ICT is recognized as one of the key 'constitutive' technologies that are at the heart of a number of these transformations. The effects of public procurement on innovation and particularly on innovation in SME's, will to a large extent depend on the selected approach and definition of public procurement of innovation. By adopting a definition according to which procurement of innovation means procurement of 'a good or service which does not yet exist' the focus is explicitly and only on radical innovation.

So, why be involved in a PCP process?

Different stakeholders can take advantage of innovation procurement processes. Figure 7 describes different benefits that can be obtained, depending on the nature of the participant. First of all, PCP enables public authorities to challenge industry to develop solutions for public sector problems that are technologically demanding and for which either no commercially stable solution exists on the market, or existing solutions exhibit shortcomings which require new R&D. Up to now, public procurers in Europe have not shown interest in getting actively involved in new technological developments until they are fully debugged and test proven in real-life customer environments: the PCP process in this sense represents a real chance for innovation.

PCP, also is key opportunity for industries, particularly SME's, whose benefits deriving from the involvement in the process can come from the improvement of the "local" public sector demand to develop innovative solutions for the societal challenges of the future; PCP can attract external financing to the "local" economy – PCP can attract foreign investors (e.g. venture capitalists) looking for promising opportunities to invest in companies involved in new emerging areas of innovation. By engaging actively as first potential customers in getting new solutions developed and tested, public authorities involved in PCPs can act as a "seal of approval" confirming the market potential of new emerging technological developments, thereby attracting new investors.

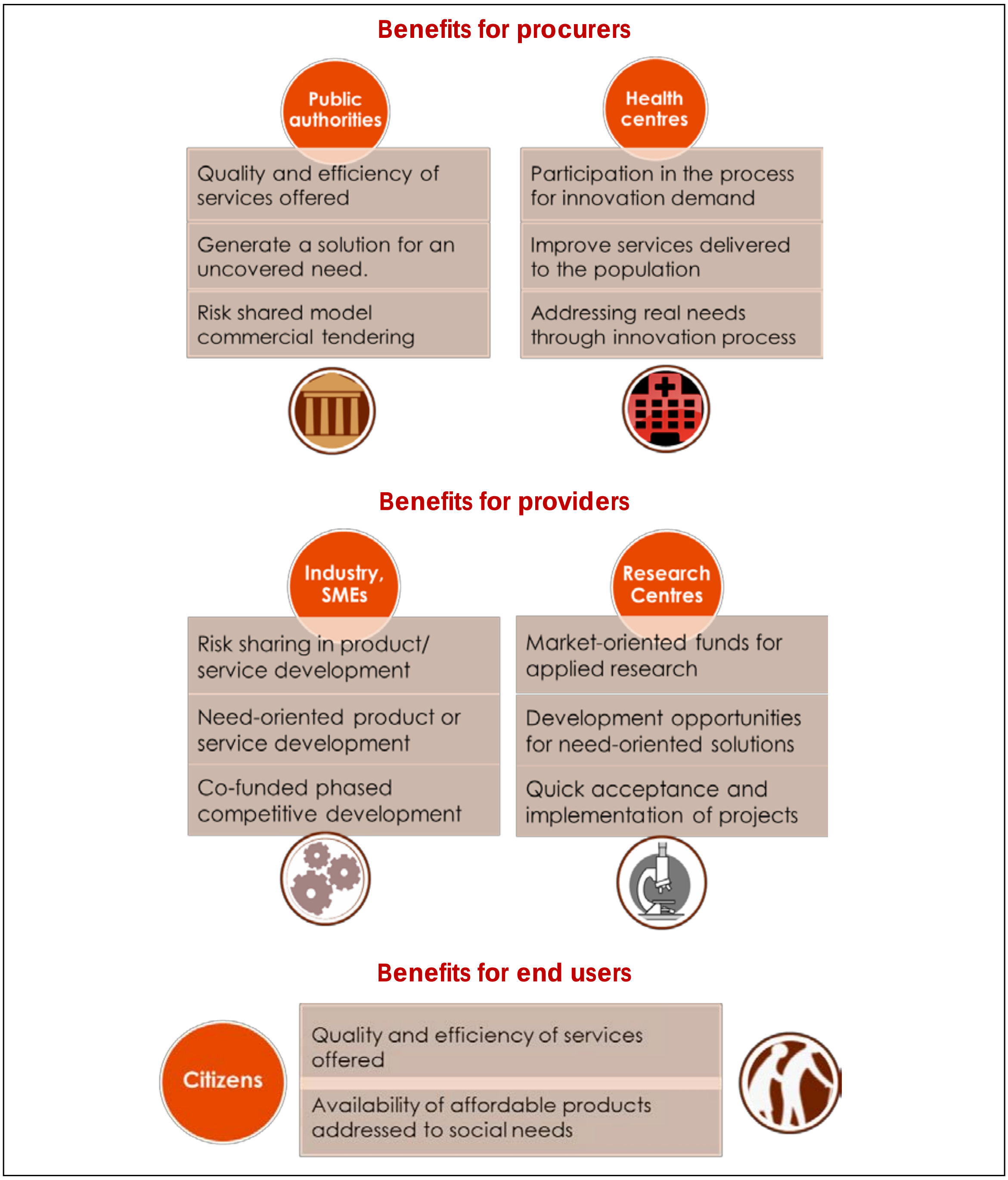

Figure 7: procurement of innovation provides benefits for procurers (public administration and health centers), providers (research centers and industry) and end-users (health professionals and citizens).

Taking into account the diversity of public sector organizations and the range of needs that can be satisfied through public procurement of innovation it is not surprising that there is a wide range of opportunities for public organizations to stimulate innovation through procurement. Possible impacts can include greater efficiencies in production, provision of incentives for innovation and development of specific technological capabilities, working as a test-bed for new technologies and thus serving as an example for the wider commercial market. Governments can also serve as early adopters of innovations and create markets for new products thus providing indirect incentive to innovate in a particular field. The scale of demand can have effect on the intensity of investment of private sector in R&D, as well as investment in new and more efficient production technology, thus leading to process innovations (Porter, 1990).

Public sector through demand of certain products or services can have impact on market structure, leading to consolidation of the market, or reducing the advantages of incumbents through procurement of new solutions and thus creating more variety in the market. Delivering contracts to public sector may provide reputational and learning effects thus creating advantages in other markets. These are just a few examples of the impacts that public procurement can have on performance of enterprises.

3.1 Who could participate in a PCP process?

Public administrators as well as entrepreneurs know the value of a “chance” both in financial and innovation terms. The Pre-Commercial procurement, as previously described in this document, represent a “chance” for the public authorities to answer unsatisfied needs of the citizens, and a “chance” for industries and SMEs to build up a new market and the related business opportunities.

The PCP process has two main sides, the demand-side and the supply-side. The stakeholders of a PCP process can be seen in

Demand-side	Frontier	Supply-side
• Public authorities • Private procurers	• Innovation agencies	• Industry • Researchers • SMEs

Figure 8: Stakeholders of the PCP procedure

By acting as technologically demanding first buyers, **public administrations, as procurers, should invest in PCP in order to drive innovation from the demand side**. In addition to improving the quality and effectiveness of public services this can help creating opportunities for companies to take international leadership in new markets. The PCP is an opportunity, therefore, **for procuring R&D services** which enables public procurers to:

- Share the risks and benefits of designing, prototyping and testing a limited volume of new products and services with the suppliers, without involving State aid;
- Create the optimum conditions for wide commercialization and take-up of R&D results through standardization and/or publication.
- Pool the efforts of several procurers;

Private procurers can also perform a PCP procedure **acting as demanding first buyers**, which allows **buying better and/or cheaper products and services** while at the same time **boosting innovation** [53].

Innovation agencies also participate in PCP as the drivers of new solutions, as they **represent the frontier in terms of research** and they should provide the knowledge to be exploited and shared with the know-how coming from the industrial side and applied to reach med/long term challenges expressed or identified by the public authorities.

The supply-side is composed of industry, researchers and SMEs. They **have to develop innovative solutions using input from the end users and future customers**, and the **demand-side** which role is **to acquire a solution which matches their development needs**. The importance of SMEs depends on the stage of particular techno-economic paradigm, or industry life-cycle. According to Perez (2002b), **SMEs play crucial role on the early stages of techno-economic paradigm**, characterized by active experimentation with designs and applications of a particular technology. Aligning this perspective to the taxonomy of public procurement of innovation [68] it is possible to design case-specific procurements of innovation that will take into account the environment in which this policy will be implemented, thus maximizing the effect of public intervention.

3.1.1 Who should lead a PCP process?

As stated in E-NO FALLS D3.1, the PCP process **can be led by Public Authorities or by the private sector** as long as they provide specific tasks and objectives to achieve. The public sector has the potential to positively influence innovation, research and development through public procurement. Nevertheless, in the private sector PCP is applied more regularly than in the public one because it has fewer barriers for procuring R&D [2].

When the PCP is performed by the public sector, PCP tenders are usually carried out by regional or municipal Innovation Agencies. Procuring Authorities establish an open dialog presenting the challenge and asking industry to find the best alternatives. Moreover, Procuring Authorities present detailed specifications, including information about the "use case" or how such a product would be used. This information is highly valuable to suppliers and communicates to the developer of the future product about who are the users, how it new solution likely to be used and what is the performance required.

Procurer Authority can lead the process by using own funds or resources coming from European funds. Provided the tender in partnership with the so called "Knowledge providers" which are actors with experience in terms of research and studies or direct experience with the final beneficiaries (users' representatives), the Authority funds several single actions which have to be leaded by enterprises (SMSs particularly).

3.2 SMEs in the Public Procurement Process

Small and Medium-Sized Enterprises (SMEs) are playing a very important role in the European economic recovery due to their number, employment capacity and the value add they bring which constitutes a large share of the European economy. In spite of the prevalent role of SMEs, the current scenario of the public procurement with SMEs seems to be a little bleak.

Due to the role of SMEs in the European economy, some polices stimulating an improvement of the SME sector performance are being driven in the last years. The SMEs sectors are distributed amongst professional, scientific and technical services (3.34 million enterprises), accommodation and food sector (1.7 million), administrative and support services (1.7 million), real estate activities (1.17 million), information and communication (0.8 million) and transportation and storage (1 million).Figure 9 shows the share by sectors of the SMEs reported in 2012.

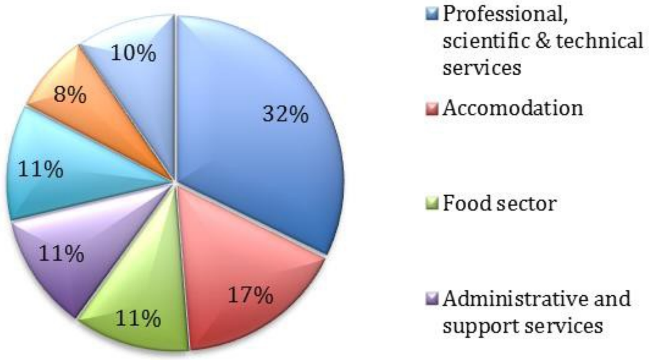

Figure 9. Sectors of SMEs in 2012. Source: [28].

3.2.1 SME portion on Public Procurement Market (CET)

The proportion of SMEs amongst companies who won public contracts above the EU thresholds ranged between 58% and 61% in the EU-27 (between 2006 and 2008) [36].

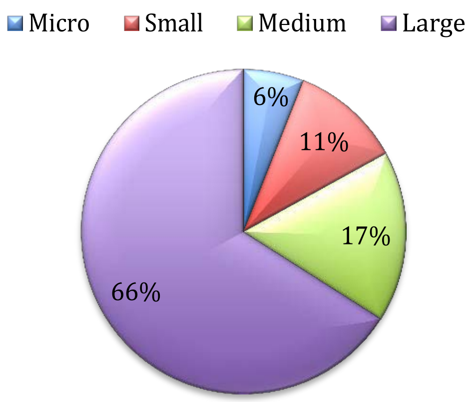

Figure 10. Companies winning above-threshold contracts for the period between 2006 and 2008 in terms of the value of the contract

European SME policy extends also over the area of public procurement. According to the European parliament [37], all public contracts must be advertised regardless of what is being bought, above a certain threshold which varies across the State members. The European parliament has established that the thresholds for EU procurements are higher than the ones for the national procurement rules. Thus, only the largest contracts have to be advertised across the EU. In the case of public contracts, the economic responsibility is assumed by the authorities, being the responsible for all works, goods or services procured. This is not the case for concession contracts, which public authorities use to engage private firms to supply services or to perform works.

According to the rules and procedures published by the European Commission and updated in 2014 [38], for tenders of lower value, national rules must be applied (always respecting the general principles of EU law). The below threshold procedures may be simplified compared to the EU-wide tenders. The main rules are cited below [38].

"For all tenders, public authorities:

- *May not discriminate against a business because it is registered in another EU country*
- *May not refer to specific brands, trademarks or patents when describing the characteristics of products & services they wish to purchase*
- *May not refuse to accept supporting documents (certificates, diplomas, etc.) issued by another EU country, as long as they provide the same level of guarantee*
- *Must make all information regarding tenders available to all interested companies, regardless of what EU country they are registered in."*

Source: Europe.eu [38]

Making it easier for SMEs to access public contracts and explicit policy objectives of the EU [39]. The challenge appears in the public procurement above EU-thresholds, which is already under rules established in the current directives from 2004. Despite the efforts of the EU to improve access to public procurement for SMEs, market access for SMEs in public procurement is still limited and disproportionately low in relation to their number throughout the EU [40].

3.2.2 Difficulties/Barriers faced by SMEs in accessing public procurement opportunities

Barriers most commonly reported in the literature are mainly the lack of information and knowledge, high administrative burdens, capacity issues and complexity inherent to this process.

Difficulty in finding information about tendering opportunities

- Public procurement opportunities are advertised in a range of places (Official Journal of the European Union, provincial newspapers, in trade journals and departmental websites... [41]). However, they are not legally required to advertise low value contracts at all.

Lack of, or poor quality, information in tender documents

- Usually, these kind of documents use jargon which can be unclear. This obstacle is augmented with the insufficient opportunity to ask questions about doubts prior to tendering.

Lack of knowledge and skills

- SMEs do not have tender specialists who are experienced and can maximize the chances of winning. As a consequence, SMEs struggle sometimes in submitting good tenders and are more susceptive to commit mistakes than large companies [42].

High administrative burdens

- The bureaucratic nature of the process, increases the complexity of the procurement and places an additional administrative burden on SMEs [43].

Lack of time to draw up tenders

- Usually, the deadlines to prepare the proposal are very short. Additionally, high levels of complexity also mean that SMEs do not have the time to work with other agencies on a joint bid by forming a consortium [44].

Large contract values

- The value of public contract is one of the major factors that influence the extent to which SMEs can access these contracts. The larger a contract (i.e. single awards/lots), the less likely it will be awarded to SMEs, starting from above ca. 60,000 euros [32].

Large size of the contracts

- Usually, the public sector prefers bigger contracts as a result of searching for economies of scale [34]. This factor, naturally excludes SMEs from public procurement contracts because they do not have the capacity to tender for the whole contract [45].

Reluctance to compete

- They may sometimes be afraid and the costs of the complexity of the public procurement process and of the legislative framework, so they do not even try to tender for public contracts [42].

Other barriers

- The cost of preparing the proposal (since many costs are fixed, SMEs face disproportionately high costs in comparison with larger enterprises); high technical qualification levels and required certification [42]; financial guarantees required [42]; no information why your tender was not chosen [35].

3.2.3 Measures to improve SMEs' participation in public procurement (FhP)

For SMEs, the tender process is complex, costly and time-consuming. They believe that the effort allocated in preparing tenders is not worth the effort due to the low probability of success, and therefore do not bid for public work at all. They cannot afford dedicated teams to concentrate in tender processes that are often complex, costly and time-consuming [44]. Hereupon, larger companies submit more tenders on average.

Increased participation of SMEs in public procurement process would be beneficial, in the sense that it would promote competition for public contracts and allow companies to innovate [46]. A number of approaches to encouraging and support SME access to procurement opportunities have been suggested in the literature. These tend to focus on simplifying the procurement process and making it more accessible to SMEs who may not have the capacity or experience to bid for large contracts with demanding qualification criteria [41]. The approaches include:

Supplying more and better information

- Communication should be in a simple language terms, comprehensive for all [44]. In 2010, the European Commission has provided the **European Small Business Portal**, which is centralized portal containing information on policy issues, programmes, projects, measures and services of the EU focused on SMEs. Moreover, the EU Code of Best Practices [45] suggests that **e-procurement** can be particularly beneficial for SMEs, and that it can encourage competition by allowing easier access to information on opportunities.

Improving the dialogue with SMEs

- More and better dialogue with the buyer can be crucial for SMEs in the enhancing their success [42]. Procurers and bidders must communicate during the tendering phase, responding to specific questions, requests for clarification.

Differentiating SMEs

- SMEs must not be seen as homogeneous group. Challenges faced by micro-enterprises, are even more restrictive than the ones faced by medium-sized enterprises [44]. Specific proposals should be developed and aimed at the micro-enterprise sector.

Reducing bureaucracy

- Efforts to reduce the bureaucracy for SMEs should consider time spent to collate the information required for bids and the level of contractual compliance required by procurers [44]. Many procurers allow the completion of the tender after submission, so that omitting certain documents does not lead to the automatic exclusion of bids [42].

Dividing large contracts into lots

- The use of lots increases the probability of SMEs winning contracts [41] and encourages more SMEs to tender for public sector contracts individually [44]. Moreover, it broadens competition, which is also beneficial for contracting authorities [45].

"Small Business Act" for Europe

- "Small Business Act for Europe" reflects the Commission's political will to recognise the central role of SMEs in the EU economy. SBA contains a set of 10 principles to make policies friendlier for SMEs. In particular, new legislations are proposed regarding company law, taxes, competition and late payments [33]. It aims is based on the application of the "Think Small First" principle. It principle aims to facilitate the SMEs' access to public procurement opportunities by giving full consideration to SMEs at the early policy development stage.

Allowing sufficient time to draw up tenders

- When setting time limits, contracting authorities must be aware that SMEs typically have little, if any, specific administrative capacity to deal with the preparation of the tender documents [45]. Also, this is particularly important to have sufficient time to find partners for joint bidding, in the case.

Ensuring that payments are made on time

- The late payment in commercial transactions is a barrier that can be avoided by defining measures to improve the payment terms.

Improving the access to finance for SMEs

- In order to improve the efficiency of the existing financing schemes, it is necessary to launch new solutions, such as the implementation of a "**Secondary Stock Exchange Market for the SMEs**". Muller et al. affirms this could be achieved through the increase in the number of financial intermediaries at the national level, the reduction of the administrative burden and the increase in the awareness of all existing support schemes among SMEs and financial intermediaries [34].

3.3 Recommendations in respect to SMEs

Considering the current picture, new policies and regulations should be drawn for the SME sector. In particular, fiscal exceptions and less regulatory requirements, for example, could potentially contribute significantly to ensuring the sustainability of the sector's partial, yet fragile recovery [34].

The increase in the number of financial intermediaries at the national level, the reduction of the administrative burden and the increase in awareness of all existing support schemes among SMEs and financial intermediaries are the most common recommendations. However, these recommendations are not dependent on SMEs but the public authorities' goodwill. In order to improve the access to public procurement, SMEs must be aware and prepared in respect to improving communication and awareness skills, experience acquisition, strategy definition and cooperation with other enterprises [48].

4. Implementing PCP and PPI

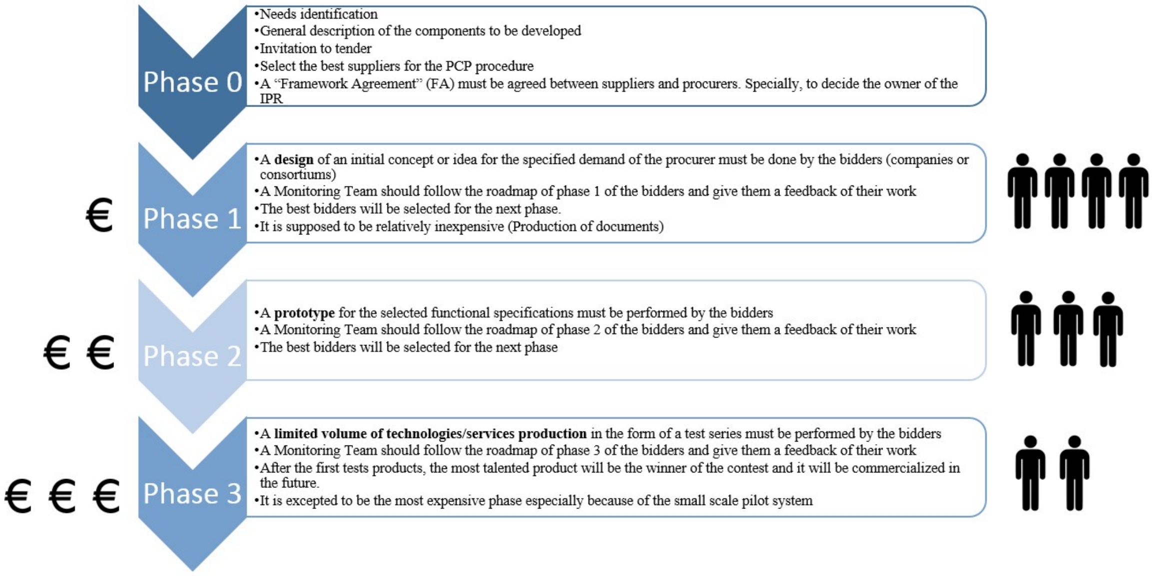

Figure 11: Phases of the PCP procedure [21], [69]

In deploying a PCP process, a Contracting Authority may run its own competition or it may decide to aggregate demand with other Contracting Authorities to run a single, collaborative competition [49]. The phases of the procedure can be seen in Figure 12. Phases of the PCP procedure [21], [74]

During the PCP process, different suppliers are competing through the mentioned phases of development with the number of competing R&D providers. Suppliers are being reduced after each evaluation phase. From the beginning, suppliers have to demonstrate to the procurement authority that they have skills to get to the end of the PCP process.

The conduction of the PCP process in several phases permits to manage and reduce the risk for the procuring organization and for the suppliers. Thus, procurers can follow more closely the product development phase and detect possible problems during each phase. Otherwise, suppliers are compensated for their development work in each phase.

Implementing PPI

PPI can be implemented in different ways by public authorities. Some of the characteristics of the process, such the budget or the scope, vary from case to case [23].

The key guiding principles to achieve a PPI are **preparation**, **early market engagement** and **tendering and contracting**. It can be seen in Figure 13. Key guiding principles to achieve a PPI

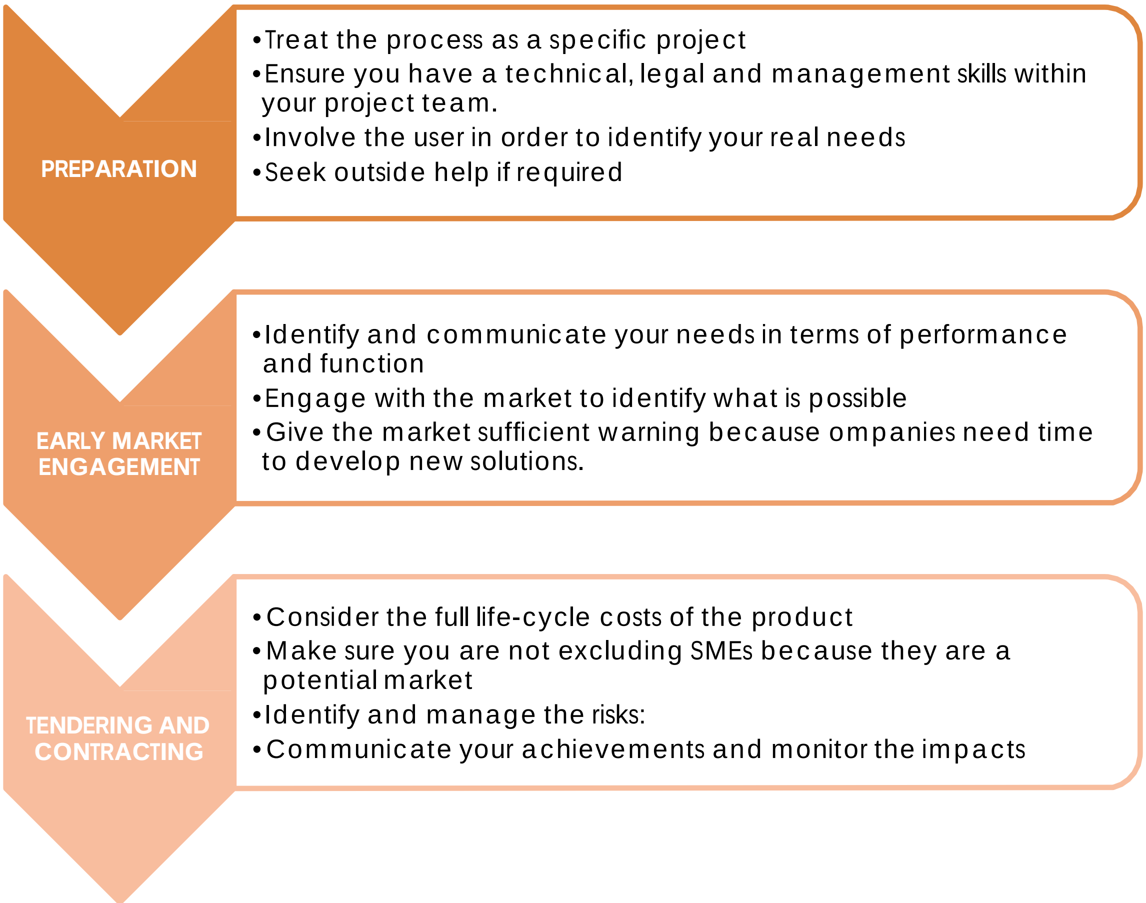

Figure 13. Key guiding principles to achieve a PPI

4.1 Differences between PCP and PPI

PCP and PPI are separate but complementary procurements. However it's not necessary that a process depends on the other [50]. A procurer authority can perform a PCP and then a PPI or independently a PCP or a PPI.

- PCP offers a way for contracting authorities to procure a R&D to address challenges of public interest for which no technological solution is available on the market yet. Using this process, benefits and risks are shared between procurers and new innovative solutions suppliers.
- In a PPI the contracting authorities act as lead costumer by procuring 'innovative' solutions (not the R&D to develop them) that are newly arriving to the market but that not have had the opportunity to penetrate on it.

Thus, whereas PCP concentrates on the R&D phase before commercialisation, PPI concentrates on the commercialisation phase. Nevertheless, the main differences between PCP and PPI appear when tendering starts, not before.

4.2 What PCP and PPI have in common?

Although PCP and PPI are developed to satisfy different needs they have two similar objectives regarding the public sector. These are improve long-term quality, efficiency/productivity, sustainability, effectiveness of public services and increase value for money in public spending.

Moreover, the main points of the procurement pathway are similar in both processes [51] [53]:

1. **Identify the end-users and stakeholders** and try to find their priorities, preferences, and needs. A validation through focus groups is encouraged.
2. **Ask the end-users their needs**: In order to ensure that any new solution will be successfully adopted, end-users must be consulted and involved at different stages of the process.
3. **Perform a market consultation** to know how covered these needs are. It's important to find appropriate ways to engage with the market and keep in touch with small- and medium-sized enterprises (SMEs). Many of the most innovative solutions come from small sized companies.
4. **Verification of innovative solutions**. It consists of testing new products and solutions with users and experiment with product variants.
5. **Allocation of risks and benefit** (including IPR), also facilitating innovation over the contract period
6. **Enable the participation of SMEs**
7. **Technical specifications** (such as the economic and administrative ones) must be included in all the documents. Bids from provider may be under tender price.
8. **Follow-up according the procurement method** (PCP or PPI) is essential in each process.

At the moment, PCP and PPI are underutilized in Europe comparing with other countries of the world. One of the reasons could be the actual legal framework [52].

Nowadays, PPI is easier to implant than PCP because PPI is already regulated in the procurement system in contrast to PCP (the new European directive will include PCP). To solve this temporal problem, currently PCP can also be approached with the general legislation. This means that there is a wide degree of specificity in the different procurement phases which may lead to completely different results.

5. Tools for implement and support the Public Procurement Process

5.1 Financing

A key issue in a PCP procedure is the financing. The financing of two successful projects will be explained in this section.

5.1.1 HORIZON 2020

The brand new EU programme HORIZON 2020, has a well-defined strategies about the public procurement as a whole, stating that "Innovation procurement can drive the R&D and deployment of innovative solutions from the demand side through respectively pre-commercial procurement (PCP) and public procurement of innovative solutions (PPI). This can speed up public sector modernization and open new market opportunities for companies in Europe. Coordination and support actions typically support procurers to investigate the feasibility and prepare the ground to start new PCPs or PPIs. PCP and PPI Cofound actions co-finance an actual PCP or PPI procurement (one single joint PCP or PPI call for tenders per action) plus additional coordination and networking activities related to the procurement [56]".

Following such assumption, the funding opportunities provided by the EU for the year 2015 deals with many areas where the ICT is applied to public services and innovative solutions of public interest, in fields as health and care, communications, learning and teaching, public transports and others.

Such kind of opportunities allows the implementations of consortia characterized by the participations of all subjects of the PPP, public authorities, enterprises, users' representatives and research institutions. And with such a kind of methodology of funding, resources may come from EU funds and managed by the public authority.

H2020 is not the only EU programme with a specific and dedicated strategy about public procurement; as also stated previously within present Deliverable and also within the whole WP3 of E-NO FALLS, the public procurement is a key tool to spread innovation and push the market breakthrough. It can be mentioned, as an example, the EU programme INTERREG which funded several projects where the PPP was intended as a tool to facilitate the regional development and the local cooperation toward the increase of local markets, particularly in the field of healthcare and assistive technologies.

5.1.2 INNOVAGE Project

The INNOVAGE [57] Project, for instance, had the aim to help older people to live independently for longer in their own homes by increasing their autonomy and by emerging of new ‘technological supply chains’ associated with new developments like independent living and eco-innovation, with a valuable contribution to minimize environmental impact of elderly daily life activities.

A key action of this successful project has been the implementation of a pilot Public Procurement experiment, in which EU funds has been used to finance a public tender for local SMSs. The INNOVAGE project demonstrated that the Pre-Commercial Procurement processes is a method for public purchasers to finance the development of ground-breaking solutions to a public problem, in view of future commercial procurement of large volumes of end products, when they have identified that the problem cannot be effectively and efficiently solved by a state-of-the-art solution.

In the specific the INNOVAGE project tested the tool named “Innovation Vaucher”. The ICT innovation vouchers' scheme is a useful instrument to include in strategies for innovation and growth implemented at local and regional levels. It enables regional and national authorities to facilitate SMEs' access to digital know-how and technology by giving them the incentive to connect with ICT knowledge and service providers. The aim is to encourage the use of new ICT-based business models.

Each scheme is not only tailored to the regional situation but is also designed in such a way as to be easy for SMEs to implement. The regions can set up and fund an ICT Innovation vouchers scheme notably through the EU structural and investment funds (ESIF). The implementation of the scheme will be processed in a decentralized way by each region or country that will decide to use this instrument to trigger SMEs' digitization and contribute to their business development.

Micro-enterprises and SMEs benefitting from a voucher can exchange the latter against ICT services, including services from private companies, universities, research centres and other accredited ICT knowledge and service providers. The voucher provides the company with easy access to specialist services, such as creating a business website and using it profitably, learning to use e-commerce tools to buy or sell, or adopting more sophisticated ICT tools for internal processes, such as better resource planning, supply chain management, and customer relations management [58].

Within the INNOVAGE project, the Marche Regional Authority (IT) launched a call for tender to local SMEs asked to develop and provide innovative ICT-based solutions to answer several elderly needs previously identified by a survey. SMEs submitted proposals that have been evaluated by the Regional Authority in cooperation with local knowledge providers and experts (COOSS Marche experts joined such evaluation team). The best proposal has been awarded with the Innovation Voucher.

5.2 Legal Framework

5.2.1 IPR management

Intellectual Property Rights (IPR) management plays an essential role in a PCP scheme. It can be adjusted to guarantee that risks and benefits are shared between the supplier and the procurer and without a clear agreement on the ownership of the IPR a real exploitation cannot be performed [54]. From EC documentation states that 100% of IP rights may not be held by the procurer but it can be less than 100%.

Provided that the IPR is owned by the supplier in a PCP scheme, there are basically 2 ways of managing IPR in a PCP.

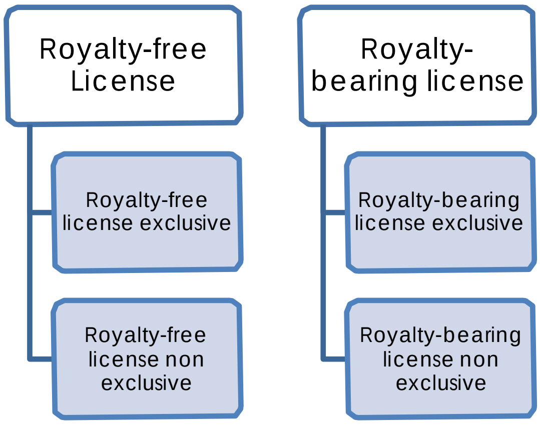

Figure 14. Ways of managing IPR in a PCP process

In a **royalty-free license** the licensor does not have to pay to the licensee for the use of intellectual property. On the other hand, in a **royalty-bearing license** the licensor get a license to use the intellectual property rights, but must pay the licensee to get it. Each license can be exclusive (only for an internal use of the procurer) or non-exclusive (the license to use the intellectual property rights could be yield to third under reasonable market conditions).

In PCP, if a provider does not continue with the project the IPRs may be transferred to other companies under fair market conditions. That is a call-back provision. Right to use the solution has to be specified in the contracting process. Moreover, a call-back provision should ensure that IPRs from companies that do not succeed to exploit the IPRs themselves under fair and reasonable market conditions within a given period after the PCP project or that abuse the IPRs against the public interest return back to the public procurers [55]. Licensing right transferability has to be defined in the technical and economic documentation to avoid future possible problems between suppliers and procurers.

IPR management may be either translated into Member State law or negotiated within specific agreements, as has been done in similar situations, for example in France or the UK.

4.2.2. Europe

Procedurally normal procurement rule apply to PCPs as they would to other public purchases. However the PCP approach is exempted from the public procurement Directives under article 16 (f) of the public procurement Directive for public authorities (2004/18/EC) and article 24 (e) of the public procurement Directive for utilities (2004/17/EC) on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts.

“This Directive shall not apply to public service contracts for research and development services other than those where the benefits accrue exclusively to the contracting authority for its use in the conduct of its own affairs, on condition that the service provided is wholly remunerated by the contracting authority”.

As mentioned above, PCP falls under this exemption as it is a mechanism to harness R&D services where the contracting authority does not gain exclusive IPR rights to the solution. Accordingly, the Contracting Authority is not obliged to comply with the strict requirements of the public procurement rules in commissioning innovation. However of course, EU Treaty principles are overarching and are applicable. The contracting authorities must treat all companies equally in a non-discriminatory, open and transparent manner. Risk-benefit sharing is a cornerstone of the PCP process and as such there is an onus on all parties to ensure that this is achieved. Also of note is that as R&D services are not included in the WTO Government Procurement Agreement, restriction of bidders to EEA countries or signatories of the Stabilization or Association agreement with the EU is in principle allowed. On a requirements basis each contracting authority can decide on their interest in worldwide offers. Public procurers can also undertake pre-commercial procurements under the current procurement rules, under the future new rules and also during the transition from current to the new procurement rules. The new provisions facilitate joint procurements between contracting authorities from different Member States. It is currently up to participating contracting authorities to define themselves the legal setting applicable to joint cross-border procurements on a case by case basis, Articles 38 of COM(2011)896 and articles 52 of COM(2011)895 intend to provide for a common legal basis for all joint cross-border procurements agreed across all Member States. This should facilitate in the future joint cross-border pre-commercial procurements.

6. Recommendations

The findings and conclusions based on the analysis of the cases have led to a number of recommendations designed to address the potential barriers to technology procurement and thus promote the take-up of approaches such as pre-commercial procurement among European public authorities, with the view to address important mid-to-long-term challenges facing the public sector while fostering innovation and contributing to the creation of new lead markets at the same time.

Market education

- Public and private players need to be made aware of the need for PCP, of the difference between PCP and conventional R&D grants and conventional procurement, of the reasons for additional instruments beyond those provided by the existing procurement legislation, as well as of the challenges, pitfalls, and solutions related to operating PCP schemes, and of the possibilities for EU.

Establishing specialised networks of public procurers

- In order to exchange information and learning from best practices examples, it is recommended to set up networks of public procurers within the specific area of ICT-based fall prevention devices [61]. Developing and using existing contact networks can help in the identification of innovative solutions, and avoid mistakes that others projects may have made.

Training recommendations

- As PCP practices are not largely used in the European procurers' community, it is necessary to improve the knowledge of the PCP concept and the professional implementation of such technology procurement projects. The training should preferably be carried out by existing institutions (e.g. business schools) and professional bodies [61].

Identifying the market needs

- Innovation management activities in public bodies are vital for identifying needs than could be addressed in PCP projects. A lead body should consider what processes exists and how to connect them to PCP.
- Consulting other public or private organizations who have procured similar needs can also be a valuable use of time in the run up to a formal procedure being launched.

Engaging with the market

- The success of a PCP project will depend on the ability and effort of finding ways to effectively **inform the market in advance** of the desired innovative and sustainable solutions [62]. An Early Market Engagement (EME) can be an invaluable method of capturing intelligence on innovations, new processes, project feasibility and market capacity/capability.
- It is recommended to improve overall **transparency** as this can encourage researchers and enterprises to think about public sector challenges and develop potential solutions, even before procurement has been launched [63].

Promoting PCP to public bodies

- A well-prepared marketing and communication plan would allow to promote the PCP and to reach the public bodies interested in performing a pre-commercial procurement.
- One option for a government, as part of their commercial strategy, is to create enthusiasm among public bodies is to offer financial support and create incentives to performing PCPs. This financial support can be done in the form of grants that part-finance a public body's process costs for performing a PCP process, and/or co-finance the contract costs for the R&D services that are purchased.

Engaging public procurers

- Encouraging public procurers to engage in radically innovative technology procurement projects requires rethinking incentives and enabling factors and structures.
- A key issue is **financing**: few public entities will be inclined to run large risks with their operational budgets. Thus, funding of innovation projects may require some redirecting of funding from other "non-essential" purposes.
- Another alternative to be considered should be awarding financial incentives from R&D agencies to procurers to undertake PCP projects. It can also be envisaged that financial schemes can be setup, in cooperation with banks and/or insurance companies, to reduce the risk of producers to procure radical innovation.
- Finally, political recognition of the importance of procurers to carry out PCP in areas of political priority is also needed. It is therefore recommended to initiate a debate with the Commission, Member States, research institutions and others on how such incentive structures could work in practice.

Designing a PCP process

- A pre-commercial initiative should be carried out with a maximum number of phases (two or three might be suitable) and then deploy these in a flexible way, to allow for case-to-case decisions on the exact number in specific PCP projects [64].
- The EU Commission recommends that at least two companies remains at the end of the last phase [64].
- In order to ensure that the budget limit for a specific PCP is kept, one possibility could be to limit the number of companies that can participate in every phase. Another possibility is to publish the total budget for a PCP, let the participating companies suggest contract costs by themselves and then chose as many high quality projects as can be accommodated within the budget frame.

Promoting bundling of demand

- In order to establish technology PCP projects with more radical innovation and commercialization potential, attracting multiple suppliers, sharing of knowledge between public authorities, and contributing to setting new standards it is recommended to promote bundling of demand at the stage of procuring R&D [61].
- Possible initiatives could include: establishing a new procurer network in the field of ICT-based devices for fall prevention; developing a database of procurers with similar interests in the specific field of interest; and working with existing European networks of potential technology procurers.

Development of solid business plans

- Development of a well-prepared and robust business plan of post-project commercialization potential are key is to attracting potential suppliers to PCP projects [61]. The business plan developed should establish clear objectives, priorities, and success indicators for the project, including the balance between performance, cost and time [62].
- As public organizations, especially at the local level, often have little expertise in preparing such business plans, it is recommended to establish links with networks of existing public/private organizations who can assist public organization in this.

Using a risk/benefit handling strategy

- The main risk for the procurers is that the suppliers do not complete the third phase, when the procurers have spent a lot of money to get the project to that point. As a tool of prevention, tender documents must encompass all phases of the process. Moreover, in PCP two providers have to end the process so if a supplier felt, the procurer would not be alone.
- PCP is a public private collaboration. This involves that the economic clauses never cover all costs. For this reason, the bid must be very attractive to suppliers to be willing to assume this kind of risk.
- A proper risk assessment technique should be used as part of the project management.

Multiple competing suppliers

- Competition it is not just a formality, it is a tool for obtaining the best the market has to offer [63].
- From a procurer's point of view, having multiple suppliers developing in parallel alternative solutions to the same problem may be a key aspect of the PCP concept. From the supplier's point of view, it is difficult to benefit from a consortium of suppliers. The rejected potential suppliers received no financial compensation for their invested resources in tender development, technology pre-development and negotiation. So, if the suppliers are to work in parallel, the benefits need to be made very clear to the potential suppliers; otherwise, they may be reluctant to participate.
- The main benefit of this strategy is the exploitation of the knowledge gained from the suppliers who do not "win" the supply contract and the innovation drive created by the competition between suppliers [65].

SME commercialization support

- Innovation, usually requires high company investment in the commercialization phase. There are several factors to take into account. These are a fast scaling-up of production, a market knowledge and familiarity with the regulations and formalities involved in regular commercial public procurements
- Examples of commercialization support directed to SMEs could be to facilitate contacts between SMEs and risk capital, to aid SMEs in finding potential partners in the form of larger companies, and to ensure that SMEs understand how to participate in regular public procurements. However, before taking-up actions, it is recommended to perform a gap analysis of the commercialization support already available in the service delivery system, to see if any vital form of support is lacking and needs to be added.
- Taking measures to facilitate the transition from PCP R&D to commercial procurement once the project is completed is also important [66].

Intellectual Property Rights Strategy

- PCP procedure could create significant risk for the supplier in terms of the potential loss of their Intellectual Property Rights (IPR) in regards to their innovative solution and the associated development costs.
- In order to protect the benefits of innovation the contracting authority should consider and develop a strategy for dealing with the protection and assignment of IPR in the very early stages of the pre-commercial procurement process.
- A balance between the strategic interests of the company and the contracting authority should be reflected in how IPR is assigned [64].
- In order not to discourage suppliers from participating in procurement process, public procurers should retain a free license to use the innovation results for internal use. Further, the public procurer should reserve the right to require the companies to license its IPR at a fair and reasonable market price to third parties and ensure a competitive supply chain. This strategy would help with standardization, including with EU and CE standards.
- The distribution of intellectual property rights and contractual obligations between companies and the contracting authority in a PCP should be published in the call for tender documents, so that interested companies are fully informed about the IPR conditions before tendering. In Annex III can be seen an example of a model contract for the Small Business Research Initiative (SBRI), introduced by the UK government in 2001 [64].

7. Conclusions

Currently, the world is experiencing economic, social and demographic changes that involve ageing population, economic downturn and climate change. Those challenges require solutions that can be found in the market or not. The analysis carried out within this study allows us to conclude that Pre-Commercial Procurement and Public Procurement of Innovative Solutions have the potential to positively influence innovation, research and development. Hence, both processes can be a successful tool to solve those social needs.

PCP and PPI are separate but complementary procurements. It is important to know the characteristics of both processes to apply them in the correct situation. PCP offers a way for contracting authorities procuring a R&D to address challenges of public interest for which no technological solution is available on the market yet. On the other hand, PPI offers the opportunity to contracting authorities to act as lead costumer by procuring 'innovative' solutions (not the R&D to develop them) that are newly arriving to the market but that not have had the opportunity to penetrate on it. In both cases it is necessary to follow the correct pathway to achieve a successful process.

Nowadays, PPI is easier to implant than PCP because PPI is already regulated in the procurement system in contrast to PCP. This means that in a PCP process there is a wide degree of specificity in the different procurement phases which may lead to completely different results. One of the main issues in the PCP process is the Intellectual Property Rights (IPR) management. Without a clear agreement on the ownership of the IPR at the beginning of the PCP process, a real exploitation at the end of the process cannot be performed. IPR ownership options include [67]:

- The supplier owns all the resultant IPR.
- The supplier owns overall IPR but licenses it for use to the procurer in a specified application or area.
- The procurer takes an exclusive license or ownership of the IPR.

PCP process allows to share the risk and profits between procurers and suppliers. Moreover, it makes benefits and issues for all stakeholders. PCP allows public bodies to acquire of R&D capacity to solve a societal problem of significant public interest. Use a systematic approach to stratify needs, assessing each need in terms of size, scale and cost. However, in some cases the public body pays market value for the R&D but does not acquire exclusive IPR rights. On the other hand, PCP procedure allows a mechanism for suppliers to access public bodies and real life problems IPR can be protected, commercialization and innovation is encouraged. Possibility for exploitation of new innovations, to scale-up business looking at other clients and other markets.

It is important to note that Small and Medium-Sized Enterprises (SMEs) play a very important role in the European economic recovery due to their number, employment capacity and the value added which constitute a large share of the European economy. PCP and PPI are a chance for industries and SMEs to build up a new market and the related business opportunities. Furthermore, the contracting authority can acquire better new solutions that are not possible to find on a large scale on the current market. Thus, promoting the participation of SMEs into PCP and PPI processes can be a key to perform successful projects.

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Annex I: Set of PCP cases

Table 1. Set of PCP cases [15], [16]

PRACTICE	COUNTRY	OBJECT	SECTOR	HEALTH AMBIT	YEAR
CARE SOCIAL MANAGEMENT	Denmark	Service management system	Health	Healthcare management	1997
SUNDHED.DK	Denmark	Public eHealth portal	Health	ITC ehealth	2004
HOSPITAL BED OF THE FUTURE	Denmark	Bed for hospital and home	Health	Devices for healthcare	2009
PATIENT BRIEFCASE	Norway	Communication tool for COPD	Health	Chronic care	2010
HEALTH LAB	Netherlands	NT for elders	Health	Elderly healthcare	
FALLWATCH	France	Fall communication device	Health	Elderly healthcare	2009
CHARM	Consortium: (NL, UK, BE)	Service management system	Mobility	Healthcare management	2012
SMART@FIRE	Consortium: BE, UK, FR, DE, NL, HUN	Integrated ICT solutions for smart personal protective equipment for fire fighters	Personal protection		2012
V-CON	Consortium: NL, FR, SWE	Virtual Construction for Roads	Mobility		2012
SILVER	Consortium: DE, SWE, FN, UK, NL	Supporting independent living for the elderly through robotics.	Health	Elderly	2012
DECIPHER	Consortium: ES, FI, IT, UK	Distributed European Community Individual Patient Healthcare Electronic Record	Health	Patient's data transfer	2013
PRACE 3IP	Consortium: IT, DE, FR, UK	Energy-efficient high performance computing	Energy-efficiency		2012
C4E CLOUDFOREUROPE	Consortium: A NL, POR, RO, S	Cloud computing in Europe	Cloud computing		2013
IMAILE	Conortium: SWE, DE, FI, ES, PT, AU, HU	Personal Learning Environments (PLE) for primary and secondary school.	Education		2014
THALEA	Cosortium: DE, NL, ES,	Telemedicine-platform developed for detection of	Health	ITC (ehealth)	2013

	BE, FI, DE, NL, ES	ICU-patients at increased risk			
ENIGMA	Consortium: NL, NO, IT, SWE, FI, FR, DE, ES	Innovative public lighting systems in part of their city fabric.	Public lighting system		2013
NYMPHA-MD	Consortium: IT, DE, ES	Services advocated for mental health treatment	Health	Mental health	2014
UNWIRED-HEALTH	Consortium: ES, UK, DE, BE	Mobile care path for consumers in order to enable patient-centric care	Health: Mobile care path for costumers	ITC (ehealth)	2014
PREFORMA	Consortium: SWE, BE, GR, IE, ES, EE, IT, DE, NL	Preserving data content	Data transferation	ICT (ehealth)	2014
INSPIRE	Consortium: FI, UK, ES, FR, IT, AT	Innovative solutions in eHealth, Active Aging and independent living.	Nordic Healthcare	Elderly Healthcare	2013
P4ITS	Consortium: BE, DE, AT, ES, FI, HU, FR, IT, LU, SWE	Cooperative intelligent transport systems.	Mobility		2013
GASSNOVA	Norway	Efficient CO_2 capture	Energy-efficiency		2011

Annex II: Set of PPI cases

Table 2. Set of PPI cases [23]

PRACTICE	COUNTRY	OBJECT	SECTOR	HEALTH AMBIT
HAPPI	Consortium: FR, UK, GE, IT, BE, LX, AUS, ES	Healthy ageing (Communication, care, mobility, eating, sleeping and personal hygiene).	Health	Eldery
FIRED-UP	Consortium: UK, BE	Environmental impact of fire services vehicles	Energy-efficiency	
ECOQUIP	UK, IT, NL, POL, HUN	Hospital equipment, consumables and services	Health	Devices for healthcare
SYNCRO	Consortium: FR, IT	Information systems for road users	Mobility	
SPEA	ES, UK, NL	Energy efficiency for municipal buildings	Energy-efficiency	
INNOBOOS TER	AUS, FI,	Office furniture and lighting	Mobility	
INNOBUILD	SWE, NOR	Sustainable building systems	Energy-efficiency	
PRO-LITE	UK, GER, IT, ES, NL,	Lighting for underground networks, transport and buildings surface	Mobility	
INNOCAT	DE, FI, SWE, FR, IT, UK	Eco-innovative catering for schools, health and welfare services and workplace canteens	Health	Healthcare management
PAPIRUS	IT	Procurement of nearly zero energy buildings	Energy-efficiency	
PROBIS	IT	New contract models for innovative buildings	Energy-efficiency	

Annex III: Model Contract for SBIR (UK): Intellectual Property Rights

All Background Intellectual Property used or supplied under this Agreement in connection with the Project shall remain the property of the Party introducing the same and nothing contained in this Agreement or any license agreement pertaining or pursuant to the Project shall affect the rights of either Party in its Background Intellectual Property.

Subject to conditions 16.3 and 17.5, the Intellectual Property rights arising out of the Project ("Project Intellectual Property") shall belong to the Contractor.

The Contractor hereby grants to the Authority and, where appropriate, the Crown, a UK wide, irrevocable, royalty-free, non-exclusive license, together with the right to grant sub-licenses, to use or publish information, Data, Results, outcomes or conclusions arising from the Project and any foreground technology for such purposes as the Authority shall in its absolute discretion deem fit.

Exploitation of Intellectual Property

The Contractor shall inform the Authority of any Results which are capable of exploitation whether patentable or not.

The Contractor shall, as appropriate, devise, publish, implement and maintain procedures for the management of Intellectual Property in the Results and in particular, but without limitation, shall use all reasonable endeavors to ensure that:

- *the Results of the Project are identified, recorded and carefully distinguished from the outputs of other research;*
- *prior to any publication of the Results of the Project, patentable inventions arising from the Results are identified, duly considered for patentability and, where it is reasonable so to do, patent applications in respect thereof are filed at the British or European Patent Office; and*
- *all such patent applications are diligently executed having regard to all relevant circumstances.*

Consistent with the good management of Intellectual Property and the continued agreement of the Authority, the Contractor shall use its best endeavors to promote the dissemination of the Results of the Project.

The Contractor may exploit commercially any publications arising from the Project.

If, within three years of its creation, any Intellectual Property in the Results has not been commercially exploited by the Contractor, and the Contractor is not using its best endeavors to do so, the Contractor shall if requested by the Authority assign the Intellectual Property Rights in the Results to the Authority and, where appropriate, the Crown.

Annex IV: Roadmap for the pre-commercial procurement of ICT-based fall prevention and effective intervention

Thematic Network
CIP-ICT-PSP 2012 Call 6 | Ref.: 325137
European Network for FALL Prevention, Intervention & Security

E-NO FALLS

D3.3 Roadmap for the pre-commercial procurement of ICT-based fall prevention and effective intervention

E-NOFALLS

Innovation Procurement to develop ICT solutions for fall prevention and intervention

Table of Contents

1 Introduction

Foreword

This document aims to provide a roadmap with the context, some information and tools to design, manage and implement an effective **Procurement of Innovation (PI)** process, which can be applied to the field of ICT for fall detection, prevention and management.

Context

Falls constitute a problem in elderly and determine the growing of morbidity and mortality by being one of the main causes for hospitalization in a geriatric unit. Estimated 80% of all accidents which lead to injuries with serious consequences are caused by falls in elderly people. Falls still constitute a major threat to the health and well-being of elderly people.

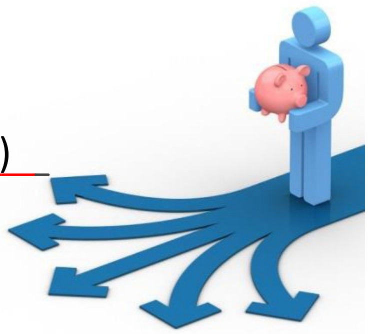
ICT for Fall Prevention and Intervention

ICT4Falls solutions aims to improve the current techniques for determining the risk of falls and help to accurate diagnosis.

With an appropriate knowledge of the risk of falls, **ICT tools enable better implementation of activities in both prevention and detection of falls**. The deploying actions (prevention and detection systems) should involve all relevant stakeholders.,

2 PI, PCP and PPI Concepts

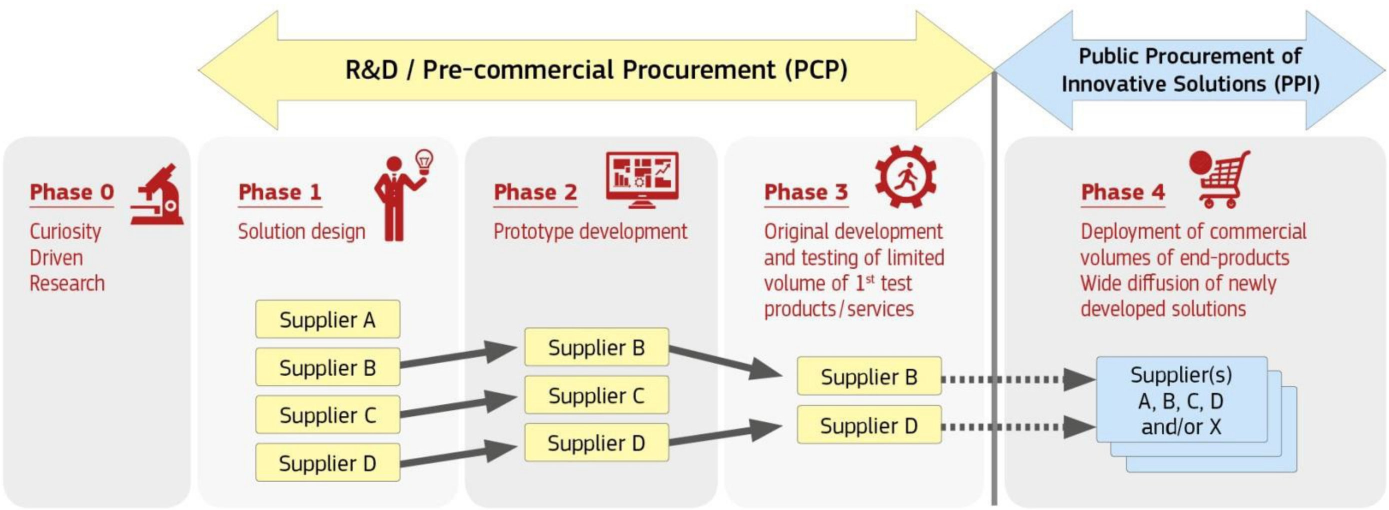
Procurement of Innovation (PI) is the purchase from a public organization of Innovation Goods and Services to solve specific needs, while improving economic competitiveness of the industry. PI processes take into account the design and delivery of public services, giving public buyers the opportunity to **influence the market towards innovative solutions**.



- **Pre-Commercial Procurement (PCP) refers to:**
  Contracting research and development services → Close to R&D (PCP Project is looking for R&D)

- **Public Procurement of Innovation (PPI) refers to:**
  Purchase of newly arrived products to the market → Close to Market (**PPI Project is looking for new solutions already available on the market but at a small scale)**

PCP/PPI Overview



3 Procurement of Innovation process

Every Procurement of Innovation process shares specific steps that should be followed, from the identification of needs until the commercialization phase.

Preparation

Identification of problem with negative impact in the provision of a service. Needs assessment.

Market consultation to search for available products/services. Align public needs with industry development pathways.

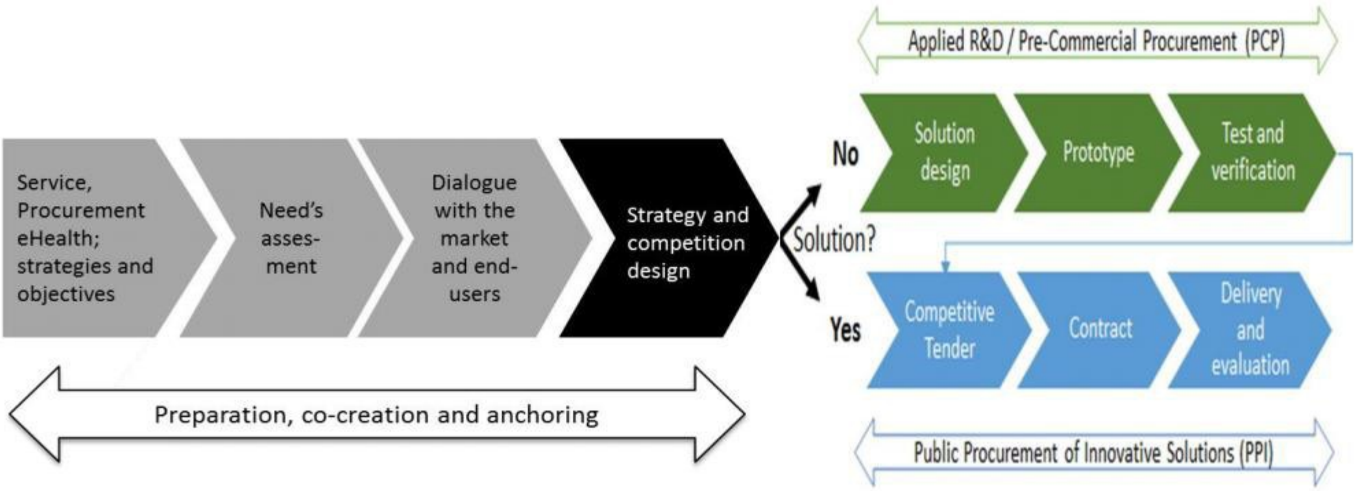
Business case: consider the impact of not innovating and the evolving scenario.

PCP/PPI tendering

Consider all information available and decide the procurement process that best fits (PCP or PPI).

Include all documentation in the tender. Provide a clear problem statement and set operational context to test the solutions.

Consider risk management and Intellectual Property Rights management.

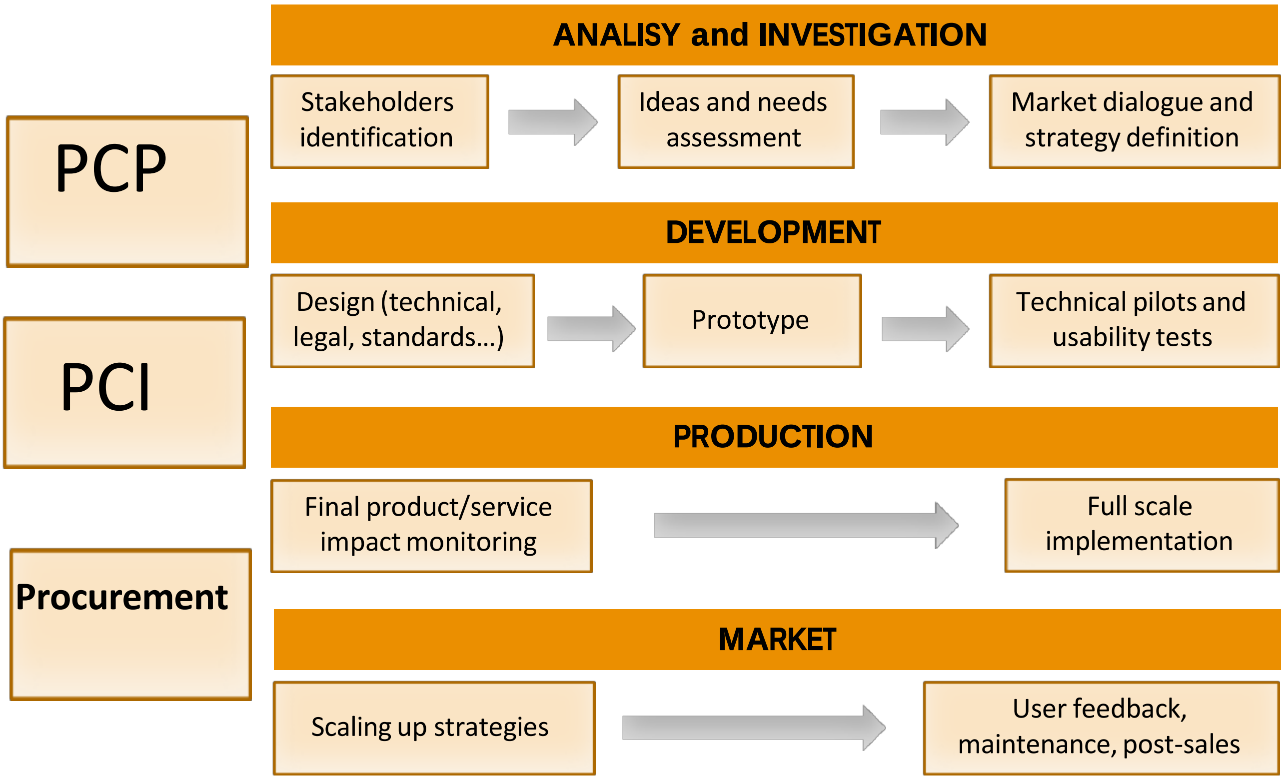


Procurement of Innovation process [1]

[1] http://inspirecampus.eu/wp-content/uploads/2014/02/INSPIRE-D2.4-TOOLKIT_FINAL24092015_PUBLISHED.pdf

4 ICT for Fall Prevention and Intervention

ICT4Falls Value Chain



Current deployment challenges

- Widespread use of ICT tools for analyzing fall risk
- Distinguishing effective systems to detect and prevent falls
- Fitting with health systems and social services
- Better scalability and deployment best practices in the field of prevention and detection
- Raising awareness to find assessment methods
- Developing more sustainable solutions
- Fostering standards and interoperability of ICT4Falls systems

5 Who can participate?

Procurement of Innovation enables public administration to challenge industry to develop solutions for demanding problems.

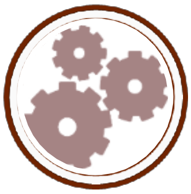
Two cases are considered: i) no commercial solutions exist, and ii) commercial solutions exist, but not deployed and tested in a given sector (only proof-of-concepts or early-adopters).

Usually, the **public purchaser starts the procurement process**. Once the process is started, the rest of stakeholders involved will be able to participate, according to the scenario set by the purchaser.

5 Who can participate?

Procurement of Innovation: stakeholders

Public authorities place an order for the fulfilment of certain functions within a reasonable period of time through the development of a new product.



Industry is the main actors involved in the development phase

Research Centers take part directly in the innovation processes by participating in the research and invention activities that influence innovation

Health Centers are particularly valuable in the design and testing phases in order to support better health outcomes

Health professionals are involved in drawing up, developing and evaluating the plans

Citizens are the main beneficiaries of the product and should be involved in the PCP project from the beginning for a user-centered approach

6 Why PCP/PPI?

In either case considered for the procurement process (PCP or PPI), procurement of innovation provides benefits for **procurers** (public administration and health centers), **providers** (research centers and industry) and **end-users** (health professionals and citizens).

Benefits for procurers

Public authorities

Quality and efficiency of services offered

Generate a solution for an uncovered need.

Risk shared model commercial tendering

Health centres

Participation in the process for innovation demand

Improve services delivered to the population

Addressing real needs through innovation process

6 Why PCP/PPI?

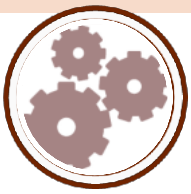
Benefits for providers

Industry, SMEs

Risk sharing in product/ service development

Need-oriented product or service development

Co-funded phased competitive development



Research Centres

Market-oriented funds for applied research

Development opportunities for need-oriented solutions

Quick acceptance and implementation of projects

Benefits for end-users

Citizens

Quality and efficiency of services offered

Availability of affordable products addressed to social needs

7 How to start?

PCP/PPI processes respond to a given need or opportunity for which either no solution is available; or it exists, but is not fully tested in our field of interest.

Ideas can arise from Health Professionals, Health Centers or Public Authorities, aiming to give answer to citizen's needs, although the <u>process is usually started by Public Authorities or Health Centres</u> wanting to purchase some innovative good or service.

7 How to start?

PCP/PPI processes need the participation of different actors at different levels. Professionals play a significant role developing new products and services delivered to the citizens.

As a health professional

Being closer to the patient, health professionals may find new opportunities and needs towards improvement of care through new products and services, **how to proceed?**

1. Once an opportunity or need is identified, do a little research on available products in the market and find those gaps which may be addressed through innovation procurement.

2. Make a brief proposal of the idea, describing the new functionalities that need to be covered, if solutions already exist in the market, including in the analysis pros and cons of the solution proposed.

3. Talk to your health center, proposing the idea and the benefits of the solution. <u>Consider making a proposal to the corresponding procuring authority in the region (Yes really important)</u>, or directly launch the process within your health center, if resources for investment are available.

7 How to start?

PCP/PPI processes may be seen as complex and resource demanding. Proper allocation of efforts, driven by experts from different sectors, will pave the way for a successful and fruitful process.

As a health/social care center

Health centers, as providers of health and social care services, have the commitment to improve services delivered to citizens. New technologies may foster this improvement, **how to proceed?**

1. Once identified the opportunity or need, with the corresponding proposal of ideas, check the availability of resources in the center to participate in a PI process.

2. Assess potential cost-reduction and service improvement with the new product or services proposed, evaluating the efforts needed and the expected outcomes (social, economic, quality of service). Define the minimum benefits and acceptable to justify the cost of being engaged in a PI process. (**Important to calculate in "complete costs", to take in consideration all the benefit in term of economy at long term and not short term. The cost of an innovative solution will often be more expansive compared to a classic solution but only if you consider the cost of the solution itself).**

7 How to start?

As a health/social care center

3. If a funding opportunity is available, select an expert team to develop the PCP/PPI process, describing in detail all the needed documentation and participation of the different actors involved.

8 PCP or PPI?

Once the decision is made to be engaged in a PI process, the procurer organization must decide between PCP and PPI, according to different issues related to the procurement scenario.

Issues to consider...

✓ What is the affordable level of risk I can assume?

In PCP process, solutions are designed and built from an idea or need, unlike in PPI, which already some products are available. Given that, there is a higher risk in PCP than in PPI to achieve a desirable solution, because no previous reference is available. In PPI you may find some proof-of-concepts or pilots with already tested solutions.

✓ What are your expectations towards the solution?

As in the previous one, PCP process aims to build still non-existent solutions, so expectations about the designed solution can be higher than in PPI. In the latter, solutions already exists, which may not fit completely our needs, but a least we have some certainty to find a solution close to the requirements.

✓ Short-term or long-term requirements and resources?

PCP process requires significantly more resources in terms of budget and time to be fully completed. Given that, PPI processes are more suitable for solutions that want to be fully deployed in the short-term, and with less allocation of resources required.

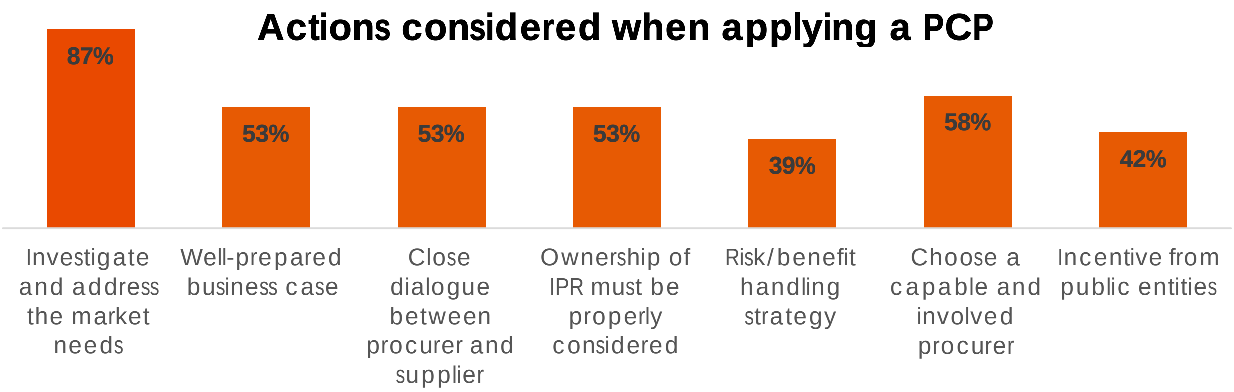
9 Critical Success Factors

Achieving relevant results from a PI process requires an accurate allocation of resources, as well as considering some **Critical Success Factors**, that is, areas in which favorable results are necessary to reach the goals targeted, where '*things must go right*'.

Critical Success Factors in PCP/PPI

Investigate and address market needs	• It is important to identify public sector priority challenges which could be addressed through PCP of innovative solutions.
Well-prepared business case	• Helps in reducing uncertainties for the supplier who will have a greater incentive to invest in the project.
Close dialogue between procurer and supplier	• The dialogue may increase the knowledge transfer and the creativity through "sparring", leading to a more efficient ways to deal with problems. TO ENSURE REACH THE MARKET
Ownership of IPRs must be properly considered	• The choice must depend on the project in question and on the capabilities and ambitions of the procurer and the supplier. Find balance between industry and procuring authorities' interests.
Use a risk/benefit handling strategy	• A proper risk assessment combined with a clear business case, would enable risk-sharing and thus make the project more attractive to both procurers and suppliers.
Choose a capable and involved procurer	• The procurer should have sufficient knowledge of the subject field of the development project, and an organization well-equipped to steer and participate in the project.
Incentive from public entities	• If public procurers, are to undertake more radical innovation projects, other incentive structures are needed, in particular larger rewards for innovative approaches and entrepreneurial behavior.

9 Critical Success Factors



Other Critical Factors

The involvement of the end-users, primary and secondary	• A user-centered approach may guarantee the acceptance of the product.
Involve legal and regulatory experts and innovation agencies	• Facilitating organizations such as innovation agencies, consultancy agencies and competence centers can guarantee the support and necessary competences to deal with this process on legal and regulatory matters
Involvement of specialized professionals and decision makers	• It is recommended the early interaction with certification bodies and compliance with quality control systems for design, testing, trialing and manufacturing.
Efficient and effective dissemination of the project	• Methodologies to disseminate the project and establish communication links to end-users may be decisive to convince the latter to buy the product.
Commitment of all partners and effective project management	• All partners should be committed in advancing the project and the benefits and incentives of each partner should be clear for the whole consortium
Streamline the PCP process	• The partners should know well the PCP process and handle it efficiently.

10 Funding Opportunities

PI processes can be funded by different means, either private or public. Private funding can be obtained from external organizations, or from investment budget of the procuring organization. Regarding public funds, two calls are described next: Horizon2020 and ESIF.

Horizon H2020

In Horizon2020 program, €33M out from €130M planned for PCP/PPI projects could be eligible for Fall prevention initiatives.

- **PCP/PPI Calls**

PCP Actions (90% funding rate): Provide EU co-financing for an actual PCP procurement (one joint PCP procurement per action) + for related coordination and networking activities (to prepare, manage and call for tender follow-up).

PPI Actions (35% funding rate): Provide EU co-financing for an actual PPI procurement (one joint PPI procurement per action) + for related coordination and networking activities (prepare, manage and call for tender follow-up.

- SC1-PM-12–2016: PCP- eHealth innovation in empowering the patient
- SC1-PM-13-2016: PPI for deployment and scaling up of ICT solutions for active and healthy ageing
- ICT-34: Pre-Commercial Procurement open
- 9 in PCPs: 1 in e-Health, 6 in ICT, 1 in security, 1 in research infrastructure
- 6 in PPIs: 1 in e-Health, 3 in ICT, 1 in Transport, 1 in research infrastructure

10 Funding Opportunities

There are also other sources of funding, coming from European Structural & Investment Funds (ESIF) which can be used in synergies with H2020.

European Structural & Investment Funds (ESIF)

ESIF and H2020 funding cannot be used “accumulatively” to finance the same cost/expenditure item, so financing must be carefully planned and specified. Next there are some considerations regarding ESIF funds

- The value of support for research, development and innovation could be further enhanced by combining funding resources (increase of effects at regional level).
- Procurers could choose for higher ESIF co-funding rates instead of H2020 co-funding rates whilst participating to H2020 funded PCP/PPIs.
- Better communication between "regional development community“ and "Horizon-Science community“.
- A regional development scheme through the participation in a H2020 project acquires a European perspective.

http://ec.europa.eu/digital-agenda/en/news/calls-eu-funding-opportunities-pre-commercial-procurement-and-public-procurement-innovative

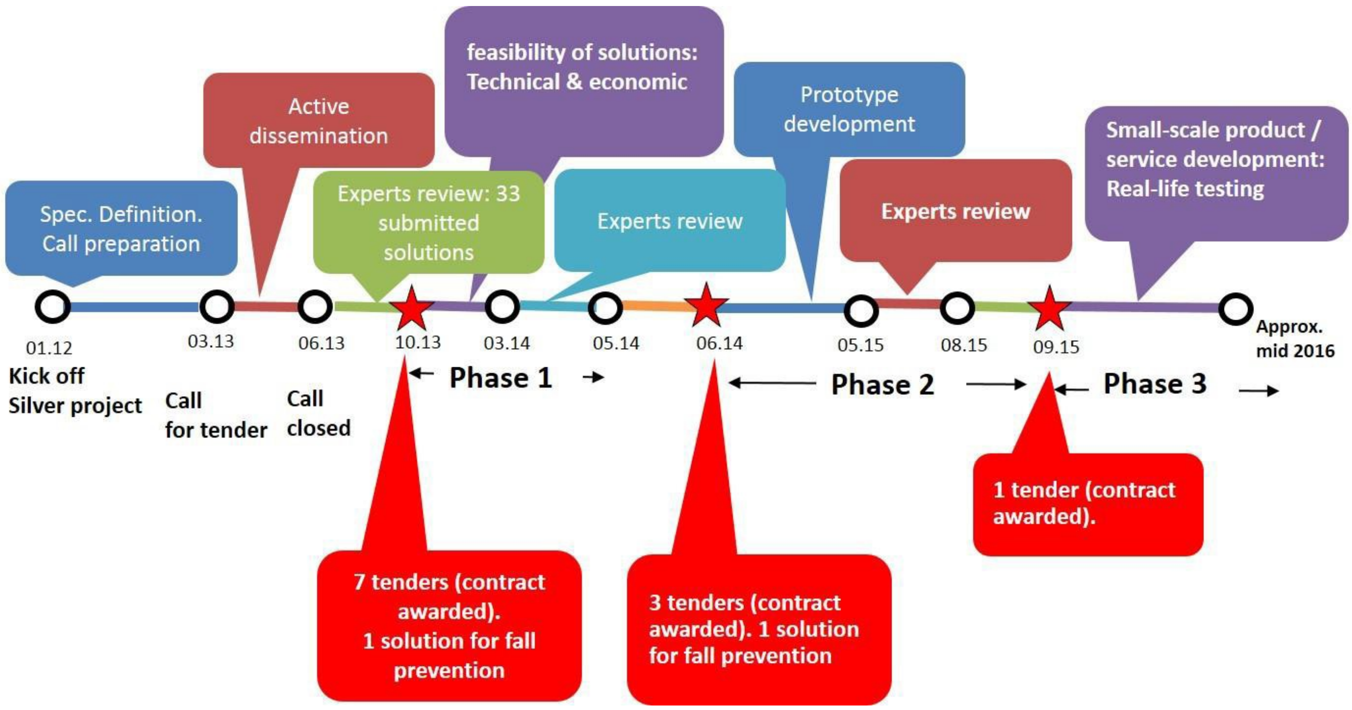
11 PPC in Practice – SILVER Project

SILVER PROJECT: Pilot Project funded by EC

Goals: Use public procurement to explore new robotics assisting technologies for elderly people to extend independent living. A generic procedure will be established and executed and will serve as model to other cross-border PCP processes.

6 Public procurers; 7 innovation organisations

Timeline of the project



DEXTERous Mobile Manipulator by Assistobot B.V.(Phase 1)
Kompaï-Robosoft by Robosoft (Phase 1)
Mealtime 360 by Bestic *AB* (Phase 1)
Wearable Bionic Exoskeletons by Marsi Bionics S.L. (Phase 1)
HelpingHand by Alten Nederland B.V. (Phase 1&2)-Fall prevention solution
Iron Arm by Bioservo Technologies AB (Phase 1&2)
Lecorob by Lerovis (Phase 1&2&3)

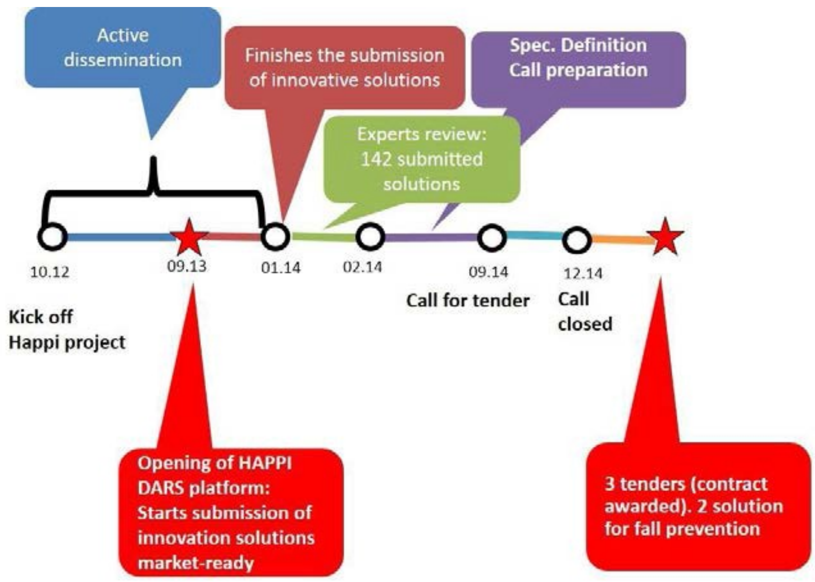
12 PPI in Practice – HAPPI Project

HAPPI PROJECT: Pilot Project funded by EC (ENT/CIP/11/C/N02C011)

Goals: Use public procurement to stimulate demand-driven innovation in healthy ageing to address the challenge of demographic change in Europe in the following fields: Telematics and electronic systems, Smart room aids, Wellbeing and ageing well, Diagnostic tools or processes, Support for care workers and ergonomic work place

7 Central Purchasing Bodies; 3 procurement & innovation experts; 2 Academics

Timeline of the project



- **Lot 1:** Fall detection and alert system: C2S with the innovative solution VAC: http://www.creative2s.fr/
- **Lot 2:** Treadmill for rehabilitation and analysis of walking disorders: Forcelink with the innovative solution C-MILL: http://www.forcelink.nl/
- **Lot 3:** Walking course for preventing falls and maintaining independence: AlterEcoSante with the innovative solution DM3: http://www.alterecosante.net/filtre-produit_utilisateur_2_4_264.html

13 Final remarks

The world is experiencing economic, social and demographic changes that involve aging population, economic downturn and climate change. Those challenges require solutions that can be found in the market or not.

The analysis carried out within the different steps of this study allows us to conclude that Pre-Commercial Procurement and Public Procurement of Innovative processes have the potential to positively influence innovation, research and development.

PCP and PPI are separate but complementary procurements. In both cases it is necessary to follow the correct pathway to achieve a successful process. PCP and PPI initiatives can be a good solution for fostering ICT solutions for fall prevention and its adoption, as following these models, risks are shared among the stakeholders and funded solutions are meeting real needs

Having a clear agreement on the ownership of the Intellectual Property Rights (IPR) is a critical issue. IPR ownership options include:

- The supplier owns all the resultant IPR.
- The supplier owns overall IPR but licenses it for use to the procurer in a specified application or area.
- The procurer takes an exclusive license or ownership of the IPR.

13 Final remarks

PCP process allows sharing the risk and profits between procurers and suppliers. PCP allows **public bodies** to acquire of R&D capacity to solve a societal problem of significant public interest. On the other hand, PCP procedure allows a mechanism for **researchers, ICT providers and service providers** to access public bodies and be in contact with real life problems.

PCP and PPI are a chance for **industries and SMEs** to build up a new market and the related business opportunities. Furthermore, the contracting authority can acquire better new solutions that are not possible to find on a large scale on the current market. Thus, promoting the participation of SMEs into PCP and PPI processes can be a key to perform successful projects.

13 Final remarks

Process and dialogue

- Dialogue as part of the process is useful and necessary when carrying out innovative procurement. Dialogue increases the procuring agency's level of market knowledge as well as the companies' knowledge of user needs.
- Innovative procurement is associated with additional costs as more time and resources to carry out dialogue, feasibility studies etc. are required.

Incentives

- Dialogue with companies and users is a main incentive for the procuring agency.
- The outlook of getting better solutions than what could be obtained through standard procurement.
- Companies' main incentive to participate in innovative procurement is connected to a commercial perspective through the demonstration of a demand and a first sale.

Risk Management

- Risks are inherent and inevitable in innovative procurement.
- There have been no formal risk management, and risks have been handled as they emerged.

Legal framework

- The legal framework does not exclude innovative procurement.
- Legal counselling and support is an important element in innovative procurement if the procurement process is to be in line with the legal framework

14 References

- **Digital Agenda for Europe. European Commission**
  http://ec.europa.eu/digital-agenda/en/innovation-procurement

- **EAFIP – European Assistance for Innovation Procurement**
  http://eafip.eu/toolkit/

- **HAPPI Project: Healthy Ageing – Public Procurement of Innovations**
  http://www.happi-project.eu/

- **Innovative Public Procurement and Health Care**. Nordic Lighthouse Project
  www.norden.org/publications

- **INSPIRE Project: International Network Supporting Procurement and Innovation via Resources and Education**
  http://inspirecampus.eu/

- **PCP related initiatives in countries around Europe**
  European Commission. http://cordis.europa.eu/fp7/ict/pcp/msinitiatives_en.html#

- **Practical guide to PCP. Implementation for Progre-EAST pilots. Innovative procurement techniques.**
  http://www.progreast.eu/files/PCP%20GUIDE.pdf

- **Pre-commercial procurement: Best practices and alternatives in the European eHealth sector.**
  S. Ikävalko, M. Rolfstam

- **Procurement Forum. European Secretariat of ICLEI - Local Governments for Sustainability**
  https://procurement-forum.eu/

- **Procurement of Innovation Platform: Guidance for public authorities on Public Procurement of Innovation**
  https://www.innovation-procurement.org /fileadmin/editor-content/Guides/PPI-Platform_Guide_new-final_download.pdf

- **Silver Project: Supporting Independent Living for the Elderly through Robotics**
  http://www.silverpcp.eu/