Policy Recommendations for advancing Pre-Commercial Procurement in Europe

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ENHANCING INNOVATION IN PRE-COMMERCIAL PUBLIC PURCHASING PROCESSES

PreCo

Policy Recommendations for advancing
Pre-Commercial Procurement in Europe

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This report is based on the analysis of the current and best practices in applying Pre-Commercial Procurement (PCP) in Europe in 2010-2011 by the PreCo project partners[1]. The report builds on findings from earlier PCP studies and reports, as well as an in-depth analysis of selected representative PreCo e-heath and eEnergy best practice cases. Based on the available evidence, the group formulates recommendations for policy instruments that can support wider deployment of PCP practice in Europe.

The sectorial differences in the two studied industry fields are discussed, along with the identification of priority areas to be addressed in order to support PCP implementation. Since the project focus is on Information and Communication Technology (ICT) enabled service creation, also the recommendations and references mostly relate to application areas that involve use of advanced technologies.

[1] PreCo (Enhancing Innovation in Pre-Commercial Purchasing Processes) is an European Commission, DG Information Society and Media under the 7th Frame Programme funded CSA project (ICT 2009 Call 4 (ERANET PLUS), Objective 9.3 General Accompanying Measures)

Policy Recommendations for advancing Pre-Commercial Procurement in Europe

1. Introduction

This report highlights the opportunities and challenges of applying the Pre-Commerical Procurement (PCP) as an instrument for public sector innovation in Europe. The state of the art in using PCP is analysed in country level, as well as through an in-depth analysis of representative cases in two sectors, E-energy and E-health. Based on the evidence, critical success factors for applying the instrument are given, together with practical recommendations for advancing the application and use of the instrument. The document also describes the European Commission level instruments used for stimulating and promoting PCP. The focus areas eHealth and eEnergy were selected as they represent areas where Pre-Commercial Procurement has high potential for break-through innovations.

This report is mainly targeted for public procurers and development agencies that wish to learn more about Pre-Commercial Procurement and practical implementation in their countries. The report will thus as a collection and analysis of best practice cases support public authorities in undertaking Pre-Commercial Procurement (PCP) actions which stimulate innovation by engaging the suppliers and the demand side actors.

In addition to practical implementation support, the report will also make recommendations for advancing the use of PCP in Europe. Through the analysis of the identified implementation barriers in the earlier reports and multiple analysed cases, the report makes recommendations for actions that the policy makers can take in order to advance the use of PCP. The recommendations are based on publicly available data that the reader can access for further information and use.

2. Background

The public sector represents almost a fifth of Europe's overall gross domestic product and has an even higher market share in areas such as construction, healthcare, environment or mobility. Simultaneously public procurement is confronted with massive economic and societal challenges with high public deficits and serious societal challenges brought by e.g. aging population, economic downturn and climate change. In the recent years it has become evident that innovation and renewal is required in both the public services and infrastructures, as well as in the processes and structures.

Pre-Commercial Procurement has been identified as one of the strategic instruments for renewal in Europe, and explicitly mentioned in the latest Commission programmes. Pre-commercial procurement is included and clearly defined as supported policy tool in the new "Horizon 2020" Framework Programme for Research and Innovation for 2014-2020, as well as in the Innovation Union commitment for public procurement, where the Member States are recommended to set aside dedicated budgets for pre-commercial procurements and public procurements of innovative products and services. Pre-Commercial Procurement has been positioned as an instrument for driving innovation, lead market creation and sustainable high quality public services in Europe.

However, while Pre-Commercial Procurement has been identified as strategic, it is still an emerging practice. Results from several surveys carried out[1] reveal that the PCP concept is still new to most public procurers, and its practical implementation is often perceived as an unfamiliar procedure.

This report addresses the main challenges related to regulatory, institutional and competence barriers to applying PCP in Europe. It describes Pre-Commercial Procurement processes in practical terms, and presents inspiring best practice cases from various member states. Recommendations are given for advancing the application and use of PCP, especially in the contexts of Ehealth and E-energy.

3. Pre-Commercial Procurement in Short

Pre-Commercial Procurement is a method for public purchasers to finance the development of innovative solutions. It is an approach to procuring R&D services[2], which involve risk-benefit sharing with the suppliers and developers, but does not constitute State aid. The legal basis for PCP in procurement law are the exemptions in Article 16.F of public procurement Directive 2004/18/EC and Article 24.E of public procurement Directive 2004/17/EC.

PCP can be described as a model for procuring innovation, and thus accelerating the renewal of public sector services and infrastructures. The process is driven by public demand, and the solution is attained through the utilization of knowledge available among potential suppliers and through co-creation with the various stakeholders.

In PCP approach the final solution is initially unknown, and therefore involves uncertainties and risk. The PCP model offers opportunities to handle these uncertainties and reduce risks. Very briefly, pre-commercial procurement allows for three important aspects:

- Risk-benefit sharing according to market conditions
- Competitive development in phases
- Separation of the R&D phase from the deployment of commercial volumes[3]

Pre-commercial procurement gives an opportunity to develop different ideas in parallel, where one or few of the initial ideas will eventually be selected for commercial public procurement in accordance with the Procurement Directives. It is a low bureaucracy, competitive process where solutions are stepwise selected or abandoned as more knowledge of the final product is gained.

PCP can also be considered as a mutual learning process for procurers, users and suppliers. The first phase in pre-commercial procurement may involve a pre-study or 'solution exploration' in close collaboration with the users. The specifications for the end product can be explored in open innovation ecosystems, like Living Labs. The development process is iterative, and

[2] European Commission, 2007. Pre-commercial procurement: Driving innovation to ensure sustainable high quality public services in Europe. Brussels, 14.12.2007 COM 2007:799 final. P. 2.

[3] European Commission, 2007. Pre-commercial procurement: Driving innovation to ensure sustainable high quality public services in Europe. Brussels, 14.12.2007 COM 2007:799 final. Pp. 6-7.

enables the stakeholders to experiment with new types of co-creation processes and methodologies.

This stepwise development process separates PCP from other similar purchasing and innovation models. However, PCP model can be combined with and complemented by other public-private innovation processes. E.g. in PreCo project, one of the objectives was to study the feasibility to apply Living Lab approach in the various parts of the development process.

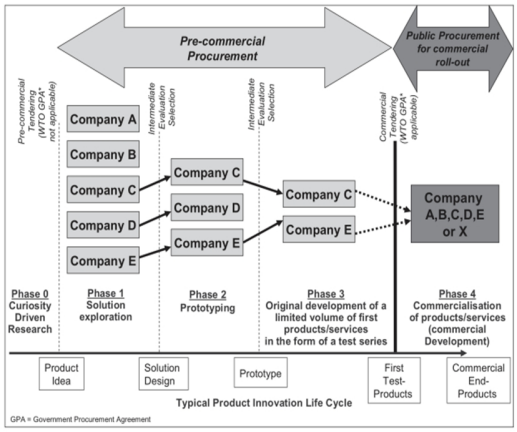


Figure 1. Pre-Commercial procurement process[4]

PCP can be implemented at local, regional and national levels, or even as a cross-border with administrations in other Member States. As the instrument matures, the objective is to implement cross-European PCP cases. Joint cross-border pre-commercial procurement also contributes to advancing the integration of the European research and innovation systems, and to solving shared European challenges.

[4] European Commission, 2007. Pre-commercial procurement: Driving innovation to ensure sustainable high quality public services in Europe. Brussels, 14.12.2007 COM 2007:799 final. P. 8.

4. Pre-Commercial Procurement in Europe

In recent years Pre-Commercial Procurement has become a feasible alternative to other public sector innovation processes in Europe. The emergence of PCP has been supported by the increased awareness and sense of urgency for the public sector to renew its' processes and structures. PCP and other pre-commercial innovation models are actively explored and experimented with in both regional and European level.

PCP has been actively promoted as a new potential instrument due to its' agility and adaptability to numerous contexts and environments. Compared to some more traditional methods, the stepwise development process enables early detection of the most promising solutions, and thus mitigates the risk of failures. Parallel development of various solutions further creates a broader view of the supply side solutions in real use contexts. The separation of the R&D phase from the competitive procurement process ensures full compliance with the purchasing directives.

The European Commission supports Pre-Commercial Procurement as one of the strategic instruments for renewal, and its' commitment is reflected through promotion of PCP in several activity levels. In policy level PCP is identified and promoted as a policy tool in several communications and programmes, most notably in the new "Horizon 2020" Framework Programme for Research and Innovation for 2014-2020. In practical level the Commission is funding activities for further developing the PCP processes, sharing of best practices, and even creating joint European PCP tenders and pilots.

The Commission and the forerunners of the Member States have put specific emphasis on supporting demand side actors in the PCP process. This includes involving the user side representatives to the definition of the specifications for PCP tenders, and as users to the pilots. This development is reflecting the trend in a related field, namely innovation policy and practice.

The results of this strategy are already evident in innovation side, where the general trend in innovation policy measures and experimentation is towards more demand-based approaches. This would further support the alignment of innovation and public purchasing policies.

The challenge in Europe is the considerable difference in the awareness and maturity of the public procurement for innovation and PCP across the countries. It is a priority for The European Commission to breach this gap that can otherwise become a significant barrier for the digital single market development.

The main channel for the European Commission support for PCP is the PCP portal[5], which features the key documents regarding PCP, including the latest reports, deliverables from EC funded projects, as well as the new calls for action. This portal provides a single point of information and contacts in both European and national level.

A further signal on the Commission commitment to advancing procurement of innovations is the support dedicated for the creation of a European-wide community of practice for PCP. The community is mobilised through numerous events and seminars for exchanging experiences with international colleagues.

[5] http://cordis.europa.eu/fp7/ict/pcp/home_en.html

4.1 The Use of Pre-Commercial procurement in Europe

In order to better understand the status and challenges in applying PCP, The European Commission made an extensive survey[6] on PCP in Europe in 2011. The survey clearly presented significant differences in the maturity in implementing PCP in the member states. There was a correlation between the PCP implementation and the country's position in the European Innovation Index. Thus it can be concluded that one of the success factors for PCP is integrating public purchasing strategies with the innovation policy.

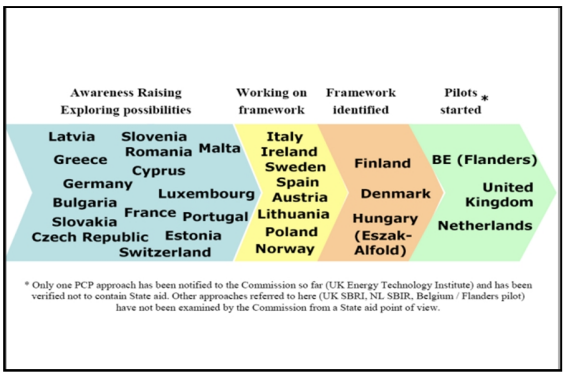


Figure 2. PCP allocation in Europe according to the European Commission PCP study in 2011

Incidentally, the results also correlate strongly with the value of the public tenders in the member states[7]. The Member States with the largest published public tenders are the most mature users of PCP. This indicates that the states where the value of the public procurement constitutes a considerable share of the GDP, more emphasis and incentives are dedicated to exploring means to increase effectiveness of the processes.

[6] "Compilation of results of the EC survey on the status of implementation of PCP across Europe (April 2011), EC DG INFSO";

[7] Public Procurement Indicators 2010

4.1.1 State of the Art Application of PCP in Europe

The United Kingdom, Belgium and the Netherlands were identified as the leading countries in application of PCP in Europe. Each of these countries has numerous ongoing pilot cases in various thematic areas, as well as clearly defined and systematically implemented PCP processes. The UK and Dutch models in place since some years back are based in the US SBIR-models originally. Slightly different from EU PCP model) This development is accounted for the fact that these countries were in a leading role in the PCP policy development and instrumentation[8]. These countries position also correlates with their position in the European innovation index, which provides further evidence for the causality between the PCP and innovativeness of the public sector in general.

The study positioned Finland, Denmark and Hungary as forerunners that have worked out how to begin PCP in their legal environments, and created support frameworks to do so. These countries are experimenting with PCP, and creating capacity for larger scale implementations.

Several countries reported having explicit plans to start PCP pilots and had identified national or regional support schemes. Countries like Spain, Italy and Sweden have avid interest for PCP, and actively follow and contribute to the European PCP community, and identify instruments for local implementations.

PreCo country analysis complemented the Commission survey with a few updates. In Italy, Spain and Sweden the recent actions taken by policymakers indicate strong commitment to developing PCP practices. Italy has established a Working Group on PCP, coordinated by the Presidency of the Council of Ministries. This "WG 4" has set up a national project to support regional research and introduction of PCP in public administrations. Spain has similar development through 'Plan Avanza" and Innocompra and Innodemanda initiatives. Sweden is actively using public procurement as a means to stimulate innovation, especially in telecommuni-cations[9] [10], and as such has frameworks available for application of PCP.

4.1.2 Conclusion

The PreCo project analysed the European PCP implementations in order to better understand the overall PCP landscape in Europe, and focus the recommendations on areas with the most urgent needs for development and support. The country analysis further highlighted the fact that PCP is a highly potential, but still an emerging instrument in Europe.

The study shows that the countries that are active in public sector development and innovation in general, are also in the forefront in the use of PCP. The leading PCP countries are also active in sharing best practices, and participating in European PCP projects and other related events and

[8] J. Edler, S. Ruhland, S. Hafner, J. Rigby, L. Georghiou, L. Hommen, M. Rolfstam, C. Edquist, L. Tsipouri, M. Papadakou 2005. "Innovation and public procurement: Review of issues at stake." Study for the European Commission, No ENTR/03/24

[9] Fridlund, Mats 1999. Den gemensamma utvecklingen Staten, storföretaget och samarbetet kring den svenska elkraftteknikken. Symposion.

[10] Berggren, Christian and Laestadius, Staffan 2003. Co-development and composite clusters- the secular strength of Nordic telecommunications. Industrial and Corporate Change. 12, 1, 91-114.

initiatives. This supports the assumption that participation in cross-country collaboration advances the level of national performance.

PreCo project 2011 country analysis provided updates and additional view points to the Commission's 2011 state of the art survey results. It identified gaps, commonalities and differences in various countries and geographical areas, in a raw configuration, of north (Denmark and Finland), Centre (Belgium, Czech Republic and The Netherlands and south (Portugal, Spain and Italy). The analysis emphasized the need to adapt PCP to local context and culture, and complement the process with other research and innovation instruments.

The following chapters will highlight identified best practice cases in the thematic areas of eEnergy and eHealth. With this triangulation of macro level data and in-depth analysis of real-life-cases we will be able to compile recommendations for practical implementation of PCP for practitioners, as well as recommendations for PCP support in policy level.

5. Best Practice Cases

PreCo analysis on best practice cases from the thematic areas of eHealth and eEnergy identified the critical success factors and implementation barriers for PCP in practical terms. It also explored the opportunities to use user driven open innovation and living lab methodologies to support the dialogue between the procurer, suppliers and users.

The findings from the cases were reflected to the earlier evidence on the barriers of applying PCP. Through an understanding of the perceived and experienced challenges, the PreCo partners formulated a list of success factors that will support practitioners in PCP project planning and implementation. This listing of success criteria contributes as one of the key findings in the PreCo project, and advances the understanding of the practical implementation of PCP in Europe.

The analysis demonstrates that there are numerous successful cases in the member states. Certain commonalities and critical success factors can be found among all of the analyzed cases, as well as across the sectors.

The main challenges in PCP use were related to the initiation and the first phases of the PCP process. The lack of awareness & political commitment to PCP as a strategic instrument for procurement has led to situation where the competences and incentives for PCP have not been systematically developed.

Supplier exclusion was considered as another particularly challenging phase in the process.

1. *Public procurer can agree on the form and conditions of ownership of IPR in negotiations of pre-commercial procurement agreements with suppliers (EuroPROC - Navigate Change)*
2. *To rise awareness on appropriate use of PCP approaches for R&D, which are not in contradiction with existing national laws (PreCo);*
3. *To ensure the level of practical readiness of legal experts in understanding of PCP approach (P3ITS);*
4. *To provide centrally support for legal and laso other such as technological ? issues (helpdesk, specific guidelines, legal expertise, etc) at national and regional level (all, PreCo);*
5. *To consider Multi-national legal PCP support body for cross-border operations (P3ITS)*

Since the projects were exploratory, there were no firm, pre-defined criteria for supplier exclusion. This could constitute a risk in terms of transparency and fairness in the process.

5.1 Identified Barriers for PCP

The main barriers of using PCP in Europe have been widely acknowledged, and can be summarised to predominantly account for lack of awareness and competence in applying PCP, as well as the lack of incentives to embarque on new, difficult and labour consuming activities.

PCP requires a variety of competences, which may not be present in the organisation. Development of these competences requires strategic decision and longer term commitment to PCP. Procurement of innovation is inherently risky, and the use of an unfamiliar procurement model can make the risk unmanageable.

In this report we take a proactive, solution driven approach, and instead of barriers, focus on the identified critical success factors. In this context we consider a success factor as a condition that may affect the outcome of an attempt to conduct a PCP project. A success factor may be something that should be fulfilled. It may also be something that should be avoided in order to achieve successful PCP projects.

The success factors are approached from the procurers' view point, and categorized them into three complementary categories using applied pattern-matching techniques for industry change by Scott (1995)[11]. We classified the evidence from the major PCP projects (EuroPROC, P3ITS, Empirica Report) into categories of regulatory, normative and cultural aspects.

5.1.1 Regulatory and Legal matters

The entries falling into the category of legal factors include issues that relate to laws, the legal system, and the practical interpretation of laws. It was pointed out that legal framework was not considered as a barrier to PCP per se, however, in some instances the legal aspects became a factor slowing down the implementation. Examples of such cases are e.g. Ministries responsible for public procurement taking an indifferent position for PCP until PCP is accepted as a new legal nationally accepted procedure. Thus the interpretation of the laws can constitute a critical success factor for the project. Based on the case analysis, regalatory and legal barriers were not the principle reasons for not applying PCP practices. However, practitioners voiced uncertainty for the legal Framework, especially in regards to the tender review proces to award the public contracts. This relates to risk aversion in terms of supplier exclusion and the subsequent commercial tender.

[11] Scott, R. (1995). *Institutions and Organizations*. Newbury Park, CA: Sage.

1. *Support harmonization of all procedures including tendering process, mixed contracts, supplier exclusion, and the subsequent commercial tender (stakeholders)*
2. *While incorporating PCP as a demand based instrument in the innovation policy mix, make sure to balance it with the other instruments (tax measures, demand subsidies, clusters) as well as with the supply side instruments (subsidies, loans) - .(OMC-PTP, 6th FP and PreCo)*
3. *Develop EU, national and regional financial instruments for PCP action, - linked to the activities of central legal support body (PreCo).*
4. *Facilitate effective, comprehensive financing packages, covering the whole investment lifecycle (Empirica report),* describe the *role of PCP in it (P3ITS)*
5. *Empower public procurers comprehensive skills (legal, technical, organisational) inside public procurers, which are necessary for each phase of PCP process in different specific domains. Use centrally organised legal support body, external PCP and domain experts.*
6. *Provide resources to develop specific skills and knowledge in public administration by providing legal and general processsupport, and examples of successful cases (PreCo, P3ITS)*
7. *To support the timescale for sustainable investments in order to use the advantages of rapid PCP process (PreCo)*
8. *To secure the post PCP phase for the subsequent purchase of large volumes*

5.1.2 Normative measures

It should be noted that the line between legal and political issues can in some cases be rather blurred. On the political side the success factors relate to the nationally accepted PCP rules of application. When the process is supported by national PCP programme, there will be mainstream strategic goals and visions defined, and PCP strategies are integrated to national innovation policies.

Transparency was considered among the main critical success factors in PCP projects, along with good communications. Transparency ensured that the best companies could be attracted to tender without the fear of losing know-how and IPRs.

On normative side the main barriers included the scarce use of public demand as a tool to support innovation, and the existence of alternative-to-classic-procurement tools. Several parties also nominated the lack of strategy for the selection of the emerging technological priorities regionally (lack of “smart specialisation strategies” such as Connected Health). Thus the competences for PCP were not systematically developed. The absence of previous cases and unclearness on whether tender and sector regulations do apply in the specific cases lead to applications of less complex administrative procedures.

5.1.3 Culture related measures

Cultures provide people with ways of thinking--ways of seeing, hearing, and interpreting the world. Thus the same words can mean different things to people from different cultures. Understanding and appreciating these "cognitive constraints" constitutes a critical success factor for PCP cases.

The main cultural aspects in PCP implementations relate more to managing risk in organisational rather than national level. PCP strives in organisational cultures and climates that promote risk taking and incentifies renewal. In PCP cases the cultures in the public sector and private companies are typically very different, which creates further tension. The parties must create their own culture and discourses which takes time, and can constitute the critical factor in the success of the projects.

5.2 Best Practice Cases in eHealth

EHealth sector is experiencing exponential growth, and new means are actively explored to stimulate innovation and institutional renewal in the sector. In this report we apply the definition of eHealth as provided by the European Commission: "eHealth tools or solutions include products, systems and services that go beyond simply Internet-based applications. They include tools for health authorities and professionals, as well as personalised health systems for patients and citizens"[12].

1. *Turn the image of public procurement and PCP into an activity, where people are allowed to take risks and ask for new solutions that pull innovations*
2. *Enable the recognition of best practice examples in public procurement of innovation at national and regional level*
3. *Support soft, non-legal instruments as well as the development of practical tools for procurement of innovation, in combination with other policy instrument*
4. *Deferent interests and incentive systems must be overcome in order to capture risk–predatory strategies*
5. *Develop skills and methodologies for cooperation, Formalize the collaboration*
6. *Overcome the asymmetry of information by increased Communications*

Since the PCP is still an emerging instrument in eHealth sector, the inclusion criteria applied in the selection of the cases is rather broad. The selected cases represent three different cases:

I. Full PCP cases, i.e. cases where PCP was successfully implemented in a procurement process in general – i.e. they serve as such as references for existing European cases or;

II. PCP-like cases, i.e. cases where only some aspects of the PCP model were successfully implemented but still offering valuable information or;

III. Cases where an attempt was made to use PCP, which could illustrate well obstacles to implementing PCP.

The cases include different technological areas, such as administrative computer systems, sensor technologies, communication technologies, robotics, but also softer aspects of innovation, such as user driven innovation and anthropological methods used to evaluate and adopt new innovations.

The benchmark cases that were analysed in depth are:

- *Electronic Registration of Patients, Jihlava Hospital, Vysočina Region, Czech Republic*

[12] e-Health - making healthcare better for European citizens: An action plan for a European e-Health Area, Brussels, 30.4.2004 COM (2004) 356 final, p. 4

- *The hospital bed of the future, Region Midt, Denmark*
- *The patient briefcase, Silkeborg and Odense, Denmark*
- *HealtLab Tsaar Peter and sensor technology, Amsterdam, The Netherlands*
- *Welfare-technology neighbourhood: robotic vacuum cleaner and the electronic keys, Copenhagen, Denmark*
- *Healthy Helsinki Living lab, mHealth case*

The case descriptions and analysis can be found in Appendix 1: eHealth cases. Based primarily on the cases described above, PreCo partners were able to identify critical success factors for PCP. These success factors will be elaborated in the Chapter 6.

5.3 Best Practice Cases in eEnergy

eEnergy sector is considered to be a key area where the impact of innovation is expected to create significant societal and economic impacts. The monitoring and controlling of energy-use, as well as information tools, such as energy demand-modelling and simulation tools, are considered as examples of innovative products and services that can be produced applying PCP models. The empirical evidence was collected in eEnergy sector by distributing two queries, one to be filled by each project partner, and another to

The two queries, allowed us to cross valuable information between the represented countries in what concerns to policy framework and public administration considerations towards Pre-Commercial procurement models, the procurement

systems and their adaptability for procurement for innovation, as well as the proximity and differentiation on the Pre-Commercial procurement model Expectations and achievements by the demand and offer side. In total twelve cases were analyzed in depth.

Note that not all analyzed cases represent pure PCP cases as described in EC Communication 799, but due to the low number of such cases, also related cases with resemblance to the PCP process were analyzed. The summary of the cases can be found in Appendix 3. eEnergy Cases.

6. Identified Success Factors for PCP Projects

Based on the case analysis, a list of critical success factors was complied. In order to ensure the validity and robustness of the findings, the analysis is based on two complementary approaches. First, the status of PCP implementation was analyzed on country level, and secondly, by detailed analysis of a set of representative cases in the domains of eHealth and eEnergy. The report builds on publicly available data and as such is fairly generic by nature.

The following practice oriented listing will enable practitioners to better identify the critical aspects of the projects. These success factors constitute practical guidelines for preparation phase for a PCP framework or even for practical cases.

The Success Factors for PCP:

- ***A.*** *Select Application Context*
- ***B.*** *Ensure Political Support*
- ***C.*** *Develop required competencies*
- ***D.*** *Create innovation friendly environment*
- ***E.*** *Create incentives for the supply and demand side*
- ***F.*** *Involve Users*

A. Select Application Context

Although PCP has a lot of promising features PCP should not be considered for all procurement situations. PCP is an instrument for innovation and increased competitiveness, as opposite to customisation of existing products or other commercial development activities.[13]. Also, even if a procurement project renders innovation, that may still not exclude other forms of public procurement.

1. **PCP can be applied to various types of innovations,** ranging from product and service innovations to design of complex systems. PreCo analysis suggests that PCP is best suited for systemic innovations that consist of various elements and interdependencies with the surrounding environments and systems, rather than for standalone product procurement.

2. **PCP should be used to evaluate and develop solutions of international standards**, rather than promote local (national, regional) companies. The application of such policy creates opportunities for spill-over effects and localisation of (global) state-of-the-art knowledge.

3. **PCP may support local innovation** with short learning circles. PCP can also support projects that originate as local ideas. Such relatively small projects lead to shorter development times and commitment to the process.

4. **Funding is required also for the prototype testing and market entry.** Real economic and societal impacts of the solutions are only realized through deployment and use. Thus funding must be extended beyond the development phase also to the user testing and commercialization of the solutions.

[13] Lucas, Rebeca and Vulcano, Antonella, 2011. PCP Manual A Practical Guide To Pre-Commercial Procurement. Innovative PROcurement techniques to support the GRowth of competitiveness for public services in EASTern Europe (ProgrEAST). Work Package 2 - Deliverable 2.1, Contract Nº 248352.

B. Ensure Political Support

The choice of the procuring model is strongly related to the prevailing innovation and development strategies. Alignment of the various political priorities and strategies, and clear focus on selected instruments and models will increase confidence and mitigate the risk of experimenting with the instrument.

1. **Successful PCP needs political support.** In most of the studied projects public support contributed in a positive way to the success of the projects. This means that the projects intentions harmonised well with current policy discourses.

2. **PCP requires process owner.** There must be genuine understanding and ownership of the problem to be solved. PCP requires a combination of skills that may not exist in the organisation, and thus a use of external consultant can be a valid solution for the first PCP cases.

3. **Long term strategic perspective instead of short term cost reduction.** Some benefits of PCP are indirect, and thus the procurer should assume long term perspective to development of innovation through PCP.

C. Develop required competencies

PCP requires understanding of the principles of the model, as well as its' implications on other activities. Factors such as the knowledge level held by the procurer and the maturity level of the procured technology must be understood thoroughly, as well as the rules regarding the intellectual property created.

1. **PCP requires In-house PCP Competencies also in running and collaborative and multiple competencies requiring process. Need of facilitations at this early stage still ?**

PCP is based on the principle understanding of the public sector as the owner of a problem that will eventually become solved through application of skills and competences available in contracted firms. The "design" of a PCP call for tender must be clear in practical and juridical sense.

2. **PCP requires thematic competences such as on eHealth/ICT competence.**

3. **Competence on IPR Matters.** PCP requires competence on IPR matters. If not such competence is naturally included in the development team, such resources should be allocated externally. When developers of the technical innovation lacked sufficient knowledge regarding legal issues, contract management and handling the distribution of IPR rights became a challenge.

D. Create innovation friendly environment

Trust among partners is the key. In several of the cases, initial development actually occurred without formal contracts. This indicates trust among the partners already in the early stages of the development.

1. **Adapt the process to local context.** There are typically numerous norms and deeply rooted processes that must be unlocked in order to ensure that PCP becomes a permanent part of the procurement process.

2. **Ideas for PCP rely on an innovation-friendly working climate encouraging learning and innovation.** The first step in a process evolving from an idea to a

commercialised product is a corporate culture that is able to encourage and capture emerging ideas.

3. **Transparency is the key.** Transparency was considered among the main critical success factors along with good communications. Transparency ensured that there is no discrimination amongst the participants. Non-transparent conditions lead to competitive environment? , and fear of losing IPRs.

E. Create incentives for the supply side

PCP process is involved with procurement of innovation, but also the economic aspects and business potential of the development must be accounted for already in the early stages of the pilot. This potential must be clearly communicated in order to involve the best supply side actors.

1. **PCP may lead to business model innovation.** The explorative PCP process may reveal potential for new business or business models beyond the originally intended innovations.

2. **PCP requires PCP Competence among suppliers.** In order to reduce risks PCP requires involvement of competent suppliers. Supplier competence concerns the understanding the principles under which public procurement and PCP takes place.

3. **Parallel development triggers learning.** The parallel development projects by various suppliers in PCP provides a learning opportunity for the participating suppliers

4. **PCP requires consideration of commercial and up-scaling aspects at early stages.** Although PCP projects may many times offer technological challenges, the commercial aspects of must be considered at the early stages of a project. The procurer should develop a business case and allocate funding for subsequent up-scaling and commercial procurement.

5. **PCP can support diversity and provide opportunities for SMEs.** PCP supported open interfaces and sharing of risk in the development phase enables SMEs to enter the market as suppliers of innovative products, or as a value chain partner for more established suppliers.

F. Involve Users

The prevailing trend in innovation development is the early involvement of the user and demand side actors. The PreCo project built on the assumption that Living Lab type of approaches could be used for PCP piloting as a platform for user engagement and feedback. The Living Labs provide an open platform for testing.

1. **PCP uses real life testing environments.** Real life testing environments especially in the prototype phase are in need and can constitute an important incentive to participate in the process.

7. PreCo Recommendations

The recommendations in this report highlight the selected aspects of PCP that the PreCo consortium considers as the priorities at this stage of the PCP implementation in Europe.

The following is a non- exclusive list of recommendations based on the overall evidence and understanding acquired during the Preco –project, including best practice case analysis, interaction with supply and demand side actors and other relevant EU-projects.

1. *Recommendation 1:*

   Clear and pronounced policy level support for PCP uptake

2. *Recommendation 2:*

   Invest in awareness raising, education and training

3. *Recommendation 3:*

   Financing common challenges - ensuring deployment and real business

4. *Recommendation 4:*

   More systematic stakeholder and User involvement

5. *Recommendation 5:*

   Focus on Evaluation and impact assessment – cost/benefit analysis

6. *Recommendation 6:*

   Competition management – market stimulation - SMES involvement in PCP

7. *Recommendation 7:*

   Interoperability for sustainability and user acceptance of the systems

A. Clear and pronounced policy level support for PCP uptake

Investigate whether public procurement of innovation can contribute to your innovation policy goals. To that end also check the other policies that are related to innovation: industry policy, specific policy domains:

1. *Demand driven innovation practices should be given priority, and political, financial and other support ensured.*
2. *Incorporate PCP with other instruments (tax measures, demand subsidies, clusters) as well as with the supply side instruments as subsidies, loans.*
3. *Make procurers taking PCP seriously. It is important that the use of PCP reflects a genuine intention to achieve innovation where the final outcome is a commercial procurement, ideally followed by global diffusion.*

B. Invest in awareness raising, education and training, also on the supply side

There is a strong need to invest in PCP awareness raising, training and education for professionals, but also to focus on reducing the asymmetry in capabilities, information and knowledge between demand and supply side actors.

1. *Provide public authorities with practical external expertise on the different aspects of the PCP process*
2. *Create innovation friendly working environments with incentives to take and show leadership.*
3. *Prepare a communication strategy with focus on improving innovative aspects of public services nad combine this with appropriate practical incentives*

C. Financing shared challenge - ensuring deployment and real business

Make a balance shift from traditional R&D&I financing towards financing of joint demand-side activities especially in emerging lead market fields.

1. *More competitive Research Development and Innovation funding, as catalyzer, should be directed towards supporting PCP for both competence development and execution.*
2. *Support also stronger companies/ innovations at the prototype and commercial phases of the PCP process.*
3. *More private finance and venture capital is needed to support the PCP prototype and commercialization phase.*

D. More systematic stakeholder involvement & user-driven innovation

In order to better respond to the changing and diverse needs of Europe's citizens, broad based participation is needed. The EU Horizon 2020 Strategy provides an appropriate base for such activities.

1. *A case adopted PCP process provides a systematic tool for co-creation. Focus in particular on joint problem area definition/ needs assessment. Combine this with sound cost/benefit analysis and risk management.*
2. *Involve the end-users throughout the PCP process using case adopted tools and models. Factor enough resources for the user testing for optimal result.*
3. *Provide better access to real life testing environments in the prototype and commercialization phase.*

E. Evaluation and impact assessment – cost/benefit analysis to show evidence

The business cases must be made realistic in order to ensure commitment and manage expectations.

1. *Explore the role of national competence centers in evaluating and monitoring eHealth provisions, implementation and deployment*
2. *Economic and financial costs and benefits must be dealt with as integrated part of all investments, including those acquired through PCP.*
3. *Specific strategies for each industry sector must be created for the sustainability of the investments.*

F. Competition management – market stimulation - SMES involvement in PCP

Transparent and non-discriminatory contract management and IPR protection throughout a flexible PCP process can secure both a learning process and a business cases even for the SMEs.

1. *Make it possible for SMEs to participate in the PCP process as a consortium or through teaming up with bigger companies. Ensure sufficient communication measures specifically towards SMEs.*
2. *A non-competitive, transparent and thorough needs assessment must be made in all cases, followed by open PCP contract specification phase*
3. *Financial support for the later phases of PCP can is needed to facilitate SMEs involvement*

G. Ensure interoperability for sustainability and user acceptance of the systems

Interoperability contributes both to the European digital market development, as well as accelerate technology acceptance in local markets.

1. *PCP can drive interoperability and vice versa, interoperability can further enhance and facilitate the use of PCP as a tool for R&D&I*

2. *Launch special PCP funding programmes other programmes and policies for research and innovation at national and regional level.*
3. *National strategies and objectives for alignment between the various research and innovation instruments must be jointly developed and committed to.*

7.1 Recommendations for PCP Cases in eHealth

In the eHealth area the evidence suggests that there is a clear need to educate and motivate public administration in the merits and processes of Pre- Commercial Procurement. Successful pre-commercial procurement action in the field of eHealth is dependent on several policy and practical level developments taking place simultaneously both on EU level and on Member States.

The analysis on the e–Health cases further emphasized the importance of awareness and competence in the pre-commercial procurement. Timescales for sustainable eHealth development projects can be lengthy, which increases the importance of risk-sharing and clear communications.

On the other hand, application of PCP could support public sector to do research and innovation activities in a more structured and efficient manner. The benchmark cases in the area come from NHS National Innovation Centre (NIC) , and present examples of rapid PCP processes, including subsequent wider commercialization. Third main finding from the cases was related to general strategic fit of the projects with the mainstream strategic goals of healthcare services. I.e. with renewal of public healthservices combined with eHealth.

The healthcare sector is still fairly conservative and has not modernized its culture and working methods to such extend as some others sectors have. Currently innovations and pro-active development activities (including process innovations) are often a no-man's land in the healthcare organizations. In these organisations ICT, procurement and medical experts all have their own responsibilities and objectives. This situation does not create incentives to fully exploit the possibilities in the so called grey areas where ownership of issues is divided.

The given recommendations are based on the case study analysis, as well as on the PreCo partners experiences in the field. Some of the recommendations link directly to the recommendations emanating from the eHealth strategies – European progress report 2011, and the final report on the public consultation on the eHealth Action Plan 2012-2020 .

Learn together in trans-European exchange of experiences.

In spite of the structural differences across regional and national Health Service systems, diffusion of eHealth solutions should be

accelerated through further improved cooperation between the EU and Member States, among Member States and between their national competent centers. The Key topics to be promoted should be related to health reform and policy priorities, including urgently needed efficiency gains of workflow processes and related resource savings.

1. *Create wider and more in depth awareness among policy makers and other stakeholders within the Health sector concerning the possibilities of PCP eHealth.*
2. *Establish a web based PCP platform with guidance on undertaking PCP/eHealth and promoting best practice examples and local experts.*
3. *Use joint pre-commercial procurement actions and policy initiatives to create collaborative learning. Use Knowledge transfer and evaluation to understand where and how organizational eHealth models used are scalable and exportable to other regions.*
4. *Focus on improving the health services and the related structures and processes in a holistic manner.*

Integrate PCP into public healthcare, procurement- and innovation strategies.

It will be mandatory to better mainstream and align eHealth implementations with strategic health policy goals. eHealth should not be the objective of a standalone strategy, but be fully integrated into overall health policies.

1. *Member States should improve ICT facilitated co-operation beyond core healthcare service providers towards an integrated well-being and care approach which includes social care providers, ambient assisted living (AAL) initiatives, and prevention and wellbeing services.*
2. *PCP should be applied also for the procurement of High-Technology/ complex product-service systems. This possibility should be considered as an interesting way of remodeling the services in a holistic way, providing also cost/efficiency gains in the care delivery systems.*

Establish common EU-wide and national thematic priorities.

The EC-facilitated eHealth Governance Initiative of Member States is a good opportunity to associate eHealth policy with the mainstream of health policy objectives. The Governance Initiative also provides a powerful opportunity for all Member States to collaboratively design the future European eHealth strategy and infrastructure. Countries are experiencing similar challenges and the same pressure on health system and societal resources; they can cooperatively build on successful eHealth practice.

1. *PCP offers a tool to address jointly the common challenges and needs in a structured and holistic way.*
2. *Further focus on jointly prioritized areas within this sector i.e. develop and implement common needs assessments involving innovative and pro-active demand side actors*
3. *Establish networks of Contacting authorities interested in this type of joint Needs assessment and market sounding exercises.*

Engage stakeholders and end-users into co-creation systematically throughout the PCP process.

Involve the end-users in appropriate phases and ways in the PCP process. Early stakeholder involvement already in the needs assessment and problem defining phase is important in the health and assisted living sectors.

1. *Provide access to real life testing environments, such as hospitals and elderly care institutions.*
2. *Consider improving and sharing of R&D infrastructures even in cross-border exercices. Thematic networks of contarcting authorities and industry clusters should try to include this aspect in their joint activities.*
3.
4. *Explore with new research and innovation instruments including Living Lab approach and open innovation.*

Standardize and Re-use individual patient health data.

There is strong requirement for further standardization and certification among eHealth professionals. A largely neglected domain in national eHealth roadmaps is the re-use of patient data in anonymised form. Member States should be encouraged to enact legislation that will help to produce such standards and require their testing, certification and application.

1. *Create a common patient data platform for sharing (open) data: Making use of Epsos standards, addressing possibly several needs & creating several solutions in the same project.*

7.2 Recommendations for PCP Cases in eEnergy

The evidence from the eEnergy sector suggested that the role of political and institutional support play a key role in the application of PCP or any other development method.

In most of the cases, public support contributed in a positive way to the success of the projects. A central point of current agendas is for example the Energy objectives of 20% increase of energy efficiency or specific renewable energy quotas in European Member-states until 2020.

Establish clear political support for environmental and life cycle thinking.

The projects' intentions need to be well harmonised with current policy discourses concerning Energy Efficiency and European Energy Policy. This ensures sufficient level of political support for the required infrastructural investments.

1. *Ensure that the PCP project objectives are aligned with those of the broader policy landscape.*
2. *Communicate the efficiency gains for the whole life cycle of the investment, and involve actors responsible for maintenance and operation of the solutions.*

Focus on life-cycle cost of the investments.

When considering public procurement of eEnergy solutions, the need to analyse solutions with the perspective of a lifecycle assessment, taking into account not only acquisition costs (CAPEX), but also operational and maintenance costs (OPEX)

and a comparison with savings gained with different technologies or solutions is essential for promoting the uptake of innovative solutions.

1. *Higher periods of return-on-investment must be considered acceptable (over 8 years). This leads to the increase in competiveness of innovative pre-commercial solutions.*
2. *Procurers should take a conservative approach to calculations on future energy prices assuming that these costs will steadily rise in the years to come.*
3. *In the absence of in-house expertise, the use of external reviewers (from Research or Academic backgrounds) should be encouraged, in order to allow for a full assessment of proposed pre-commercial solutions.*

Apply User Driven research methods, like the Living Labs Methodology

Project implementation and solution success can greatly improve with the use of Living Lab methodologies in the design and prototyping process of RD&I of new solutions related to eEnergy.

This is a key methodology that allows for successful user behavior transformation through the use of a co-creative, user driven ecosystem that involves all stakeholders and enables the achievement of energy efficiency behavior transformation and solution acceptance by final users in a sustainable way.

1. *Apply the Living Lab concept during several phases of the Pre-Commercial procurement process.*
2. *Make a case-by-case assessment of the benefits of user involvement based on the role of the user in using the solutions.*

Develop industrial policy to ensure horizontal market structure

There is ever increasing demand for the facilitation of smart grid interoperability and a common communication standard between the various metering, energy management and other grid-integrated technologies.. Currently, many of these rely on proprietary protocols, which results in vendor lockdown – this means that the already fragmented European market of SMEs that delve in the eEnergy business acts as a bottleneck for a horizontal approach of solutions and protocols.

1. *Support the development and standardization of the interfaces and the middleware to overcome the current vertical market structures, in which each vendor has its own specific systems without external interfaces so that users are locked into long-term arrangements with specific providers.*
2. *Align industrial policy development to enhance vertical alignment and to avoid lock-in situations that create monopoly situations and lower the innovation rate.*
3. *Focus in open-data platforms that allow for the creation of new innovative solutions (namely in the development of groundbreaking energy management systems, virtual power plant networks, smart grids, etc.) and business models.*

Appendix 1. EHealth Best Practice Cases

Case 1. eAmbulance: Electronic registration of patients in Jihlava Hospital

https://www.eambulance.cz/

This case study describes the development of a new eHealth service for citizens of Vysocina, achieved in cooperation of Vysočina Region (CZ) with the Institute for Information Industry (Taiwan). The case is dealing with the successful preparation, implementation and pilot operation of the Electronic Registration of Patients in Jihlava Hospital during the year 2010. The project has got finally the name eAmbulance.

Background

Vysocina is ensuring health services in several regional hospitals, including hospital in the main regional city Jihlava. The idea to suggest to citizens better, cost effective and innovative system for electronic registration of patients was in the air. The preliminary intention was to discover the online system, which would be user-friendly and interactive, saving time both for citizens and for administrative personal of hospitals.

It was discovered, that the traditional process of Public Procurement may not bring the most innovative solution, so some elements of PCP were applied.

The most innovative solution, which had already been approved in practice was suggested by the largest ICT organization in Taiwan - Institute for Information Industry. Based on the information from technological experts from Vysocina IT Department, and on the demand expressed by JIhlava hospital, the President of Vysocina, Mr. Jiri Behounek, sent a letter to the pre-selected partner in Taiwan in December 2009 expressing the interest to cooperate on a pilot project: e-Registration Systems in the network of regional hospitals. The e-Registration System would enable advanced and friendly internet registration and voice registration functions to the citizens improving the current registration service provided by the hospital.

The Taiwanese delegation has visited Vysocina Region and after negotiations has submitted an official agreement for formal approval by the Region.. The implementation of the system began in April 2010, testing was lasting till Autumn 2010, and from Spring 2011 the system is fully operational.

Project Objectives and Benefits

- To improve the efficiency and quality of the registration service provided by the Hospital to the Region's citizens through the innovative e-Registration System with functions of advanced and friendly Internet registration and voice registration in the Regional Jihlava Hospital.

- To pilot the new service (e-Registration) for the future implementation in the whole network of Regional Hospitals and to improve in general future healthcare system in Vysocina.

- To utilize non-European know-how from Taiwan in order to rise the level of healthcare services for Vysocina citizens and to reach recognition as the leading "eHealthy Region" in the Czech Republic.

- To provide all users of the system, including doctors, management of the Hospital and regional administration staff involved, with the easy-to-use system to evaluate the eHealth service provision in Vysocina.

All those objectives were achieved, and during the preparations of the pilot some innovations of the system were developed by the Czech ICT team in cooperation with the Taiwanese (see below).

Why is this project to be considered as pre-commercial procurement?

The case is an example of practical attempt to support innovation in Public Purchasing of technological solutions. The selection of the innovative solution and the whole process of the project cooperation include the majority of the phases of the Pre-commercial procurement of innovation, based on the typical research and innovation life-cycle, transforming an idea into a product/service. There are in particularly:

- Direct public R&D investment in the first phases of the project
    - Phase 1: Exploration of the solution of the problem of missing electronic system of registration in regional hospitals – the feasibility study has been developed, contacting some of the regional suppliers
    - Phase 2: R&D up to prototype – direct investment into the gap analysis, fiction tailoring and the ICT environment preparation – customization of the existing service
    - Phase 3: The pilot product testing – in one of the regional hospital (Jihlava)

- Sharing of the costs – the procurer (Vysocina) and the selected supplier (III Taiwan) agreed to share the costs of the Phases 2 and 3
- Sharing of the R&D risks – in case the system would fail for any reason
- Commercialisation of the final product – the electronic registration system is going to be implemented as a service in all of the regional hospitals, based upon the regular public procurement

Project Tasks

- Kick off
- Gap analysis and function tailoring
- ICT environment preparation and system installation
- Training for basic data preparation
- Basic data entry and verification
- Training for ICT staff
- Training for end users

- System integration and parallel testing
- On production preparation
- On production and stand by
- Maintenance service

Pilot Cost Estimation

For the pilot project implementation the shared costs model was agreed by both sides. The overall budget of the pilots was slightly over 120.000 EUR, from which 2/3 was financed by Vysocina and 1/3 was co-financed from Taiwan national funds. The break cost estimation for the e-Registraion System implementation and one year maintenance support for Jihlava Hospital is listed in Table 1 (see below).

Item	Description	Cost (CZK)	Remarks
1. License fee	(1) e-Registration System	882,352	
2. Customization fee	(1) Gap analysis (2) System interface (3) System design (4) Programming (5) Testing (6) Translation	3,529,410	(1)30Man/Month (2)117,647x30=3,529,410
3. Remote Diagnos and Maintenance Support	(1) 1 year service	117,647	
4. Installation and On -site Training	(1) Installation (2) On-site Training	176,470	
5. Travelling Expense		1,058,814	1. Air Ticket 32,353 x18 times = 582,354 2. Food and Lodge 2,647x10 days x 18 times = 476,460
Total Cost Estimated		5,764,693	
Total Price Proposed		3,000,000	
Total Price - Vysocina		2,000,000	

Tab. 1 Project Cost Estimation in CZK

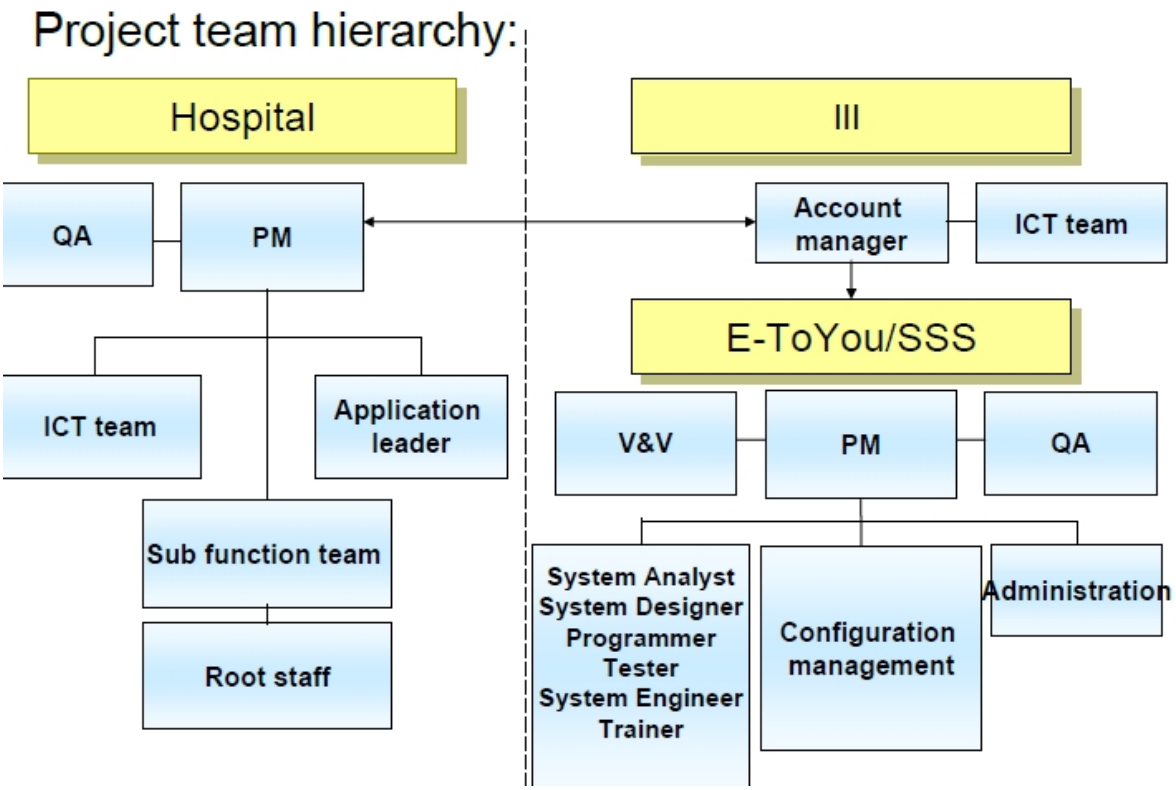
Main conclusions from this overview are done at the end of the document.

Project multidisciplinary team

For the pilot project "e-Registration System in Jihlava Hospital" a multidisciplinary team was created of experts from Vysocina Regional Authority + JIhlava Hospital + Taiwan team:

- from the Czech side, the Project Manager was dedicated from the administrative staff of Vysocina Regional Authority (which is supervising and financing regional hospitals). The ICT team included experts from Regional IT department as well as from Jihlava Hospital IT department.

-the Taiwan partner has created a project team consisting of members with extensive e-Hospital and eHealthcare experience from III, e-ToYou International Inc. (subsidiary company of III) and Soloman Solution Services Corporation (cooperative partner of III). Those three companies have successfully planned and implemented a number of projects in e-Hospital and eHealthcare systems. The team was leaded by the Account manager.



Selected Taiwan supplier - Company Profile

Institute for Information Industry (III), http://www.iii.org.tw, was established in 1979, through the joint efforts of public and private sectors, as a Non-Government Organization (NGO) supported by the Ministry of Economic Affairs. Currently, with 1,900 system/software engineers, III is the largest ICT organization in Taiwan. In the fields of Hospital Information Systems (HIS), National Health Insurance Systems (NHIS), and Health Information Networks (HIN), III has more than 20 years of experience successfully planning and implementing these systems. III is a major health-related systems provider in Taiwan with international implementation experiences as well. Keeping up with the latest developments in the fast growing field of ICT technology, III consistently provides the best quality solutions of software, hardware, and services.

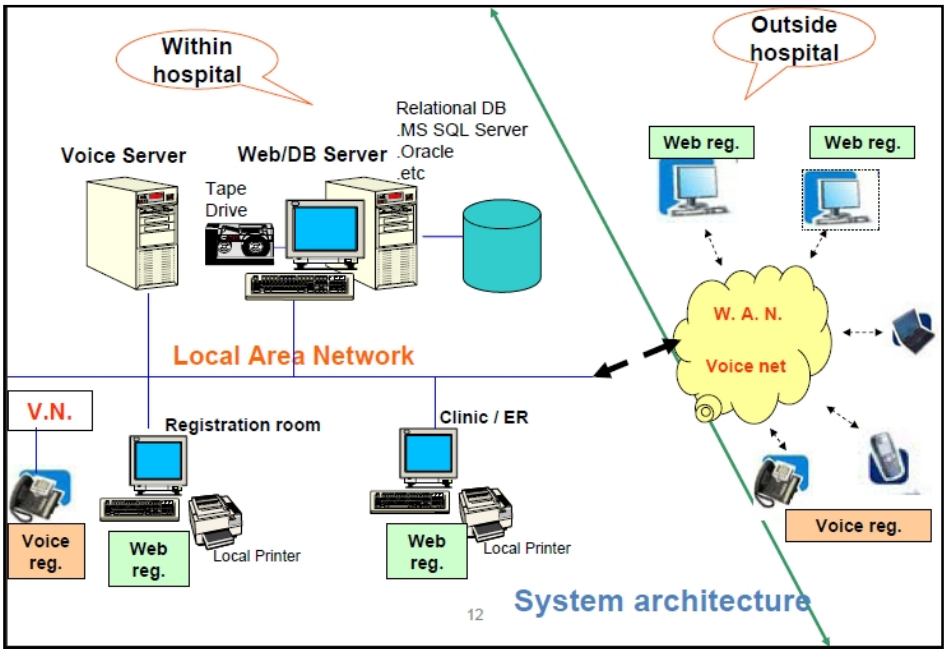
Innovation developed during the pilot

The original system of eRegistration, successfully running in Taiwan, was significantly innovated during the preparation for the implementation in the Czech Republic. First of all, some changes were done in the design of the main interface with users, taking into account differences between graphic culture of Europeans and Taiwanese. Then, the very process of registration of patients was simplified towards higher user-friendliness, due to high level of programmers in the Czech team, some functionalities were reduced for 1 click instead of 3 ("less clicking") during the registration.

The third, the system was enriched with the automated report generating utility – on demand of doctors and management of the Hospital as well as of the Region. For doctors, the summary of patient's records was introduced, as well as so called "*Black list*" of those non-disciplined users, which are often registering themselves for a visit to a doctor, but never come. After 3 time of reservation without visit following, such users are erased from the system with restrictions for the future registration in order to release the time slots for those with real needs.

As the next significant innovation upon the original system, the Czech team has developed the notification service for patients: the first notification is coming directly after the registration to a doctor, the second is confirming the time slot and the reservation, the last is coming the day before the visit planned as a "remind" message. The messages are sent to email or as SMS to a mobile- depending on the choice of the user.

The next diagram shows ICT environment preparation and system installation (fig. 4).



From operational point of view, the system is very user friendly and is operable from any internet browser.

Conclusions

The case eAmbulance, https://www.eambulance.cz/, is an example of practical attempt to support innovation in Public Purchasing of technological solution for improving eHealth services in Vysocina Region.

- Intention: to investigate and pilot the innovative technological solution for online registration (including voice registration) of patients for hospitals in Vysocina
- Partners: IT department of Vysocina RA + Institute for Information Industry (TchaiWan)
- Objective: to provide better eHealth services to citizens in Vysocina (customers of hospitals)

- Timing: All phases during 2010, piloted in Jihlava hospital from Spring 2011 – now fully operational service

The selection of the approved and innovative solution and the whole process of the project cooperation include the majority of the phases of the so called Pre-commercial procurement of innovation, based on the typical research and innovation life-cycle, transforming an idea into a product/service. Direct benefits are:

- relatively low costs of the initial analyses of the SoA situation (missing electronic system of registration of patients in regional/national hospitals)
- effective system of pilot testing and evaluation, all phases during 2010, piloted in Jihlava hospital from Spring 2011 – now fully operational service
- risk and costs sharing principles with the selected supplier, the budget over 120.000 EUR (2/3 financed by Vysocina and 1/3 co-financed from Taiwan national funds)

After the successful piloting in Jihlava Hospital, the eAmbulance project is now prepared for the implementation in the next 5 regional hospitals in Vysocina . Due to the fact, that the overall costs for the implementation of eRegistration system are under the limit stated for the traditional Public Procurement, no other procurement procedures are required.

Case 2. The hospital bed of the future

The second case is collected from Denmark and concerns a procurement project called 'The hospital bed of the future'. The hospital bed of the future project is a pre-commercial project intended to lead to an innovative bed evolving in the Region Midtjylland. The basic problem that made out the starting point for the project was the observation that nurses spend too little time with patients. It was found that the delivery of care in interaction with patients takes only 1/3 of nurses' working time. The project followed from the ambition to increase the share of the time nurses spent together with patients to 60%. The project is still running and was initially scheduled to be finished 2012. The final outcome of the project is therefore not certain at this stage. Components that have been considered to be integrated into the final bed solution are scales, humidity sensors, and screens for television and computer/ Internet access. The project should create the basis of commercial procurement of hospital beds to supply the whole Randers Regional Hospital (who procures 100 beds a year, which is equal to an investment of 3.000.000 DKK a year). Ideally, the project could also provide a basis for procurement of hospitals beds to the whole region including both hospitals, nursing homes etc. (which lies in the area of 600 beds a year – at the cost of roughly 18.000.000 DKK a year). The Price of a hospital bed is 30.000 DKK. The hospital bed of the future project is a part of a larger project named 'More time to the patient'. The other two projects have to do with self-cleaning toilets and room-dividers. The project(s) are anchored at Randers Regional Hospital, Denmark. Randers hospital is currently undergoing a transition from being a regular hospital to an emergency hospital. Emergency hospitals are set-up to treat any kind of care-seeking patients. Regular hospitals are generally smaller and accept only planned or pre-arranged admitting of patients where diseases/ problems as well as treatments are already established. For the hospital the transition required different kinds of upgrading. They needed to be able to provide any kind of medical specialty; hire new doctors; procure new kinds of equipments. They also needed to establish a network of University Hospitals in order to be able to transfer patients requiring specialist treatments.

Background

This project developed at Region Midtjylland which is the regional authority responsible for healthcare, including hospitals, and practitioners of that part of Denmark. The initiative and idea for the project came from a Head Nurse at Randers Hospital, who saw this as a way to respond to the many complaints from patients about lack of interaction with the health care staff. What further justified the project was an internal study, which showed that the health care staff only spent 30% of their time with the patients. The Head Nurse continued arguing for the need for the project, which she named 'More time for the patient' – and after about 5 years – she was granted 5.000.000 DKK for the project from the Regional board (the political leadership of the region). Midtlab, an internal innovation-hub in the Region Midtjylland, got involved to facilitate the project.

Their main objective is to contribute to innovation in the public sector and motivate social entrepreneurship. Their special competences are to create and support cross-sectional partnerships (both public-public partnerships, and public-private partnerships). Parallel with this, an internal project manager at Randers Regional Hospital was selected. This manager's job was to coordinate the project internally but also to take part in outlining the project specifications. This

manager is also handling the transition at Randers Regional Hospitals – from regular hospital to emergency hospital, which means that part of his job is also to synchronize the new initiatives/efforts. With the internal (regional) group in place the procurement process started.

Although this project is managed within the Region Midtjylland, what is noteworthy is that those facilitating the project are not the same organisations that will eventually buy the innovative bed. The potential procurer would be hospitals in the region and from elsewhere, but, also individuals where considered as future customers. In that sense the actual project is an example of catalytic procurement, i.e. public procurement of innovation where the procurer creates demand on behalf of others. The ambition was to develop a bed that is flexible enough to be useful for hospitals as well as for private homes: It should be a bed useful for future care wherever it will take place. The Region Midtjylland would be one obvious procurer for some of the beds. Also a Region in Sweden that is part of the project belongs among future procurers.

The project, partners and selection mechanisms

The tender process for the development project took place in 2009. The 23 June that year an information meeting was held at Randers hospital. The meeting welcomed suppliers of beds and other assisting technologies in health tech, design firms, research institutions, architects specialities in hospital design, and other companies with interest in development or marketing of health tech[14]. Competitive dialogue was used as the procurement procedure. The selected providers were: Design Partners (design firm); Cetrea (an IT developer), Linak (developer of actuator systems and IT); Danish technological institute (a non-profit knowledge dissemination agency; KR beds (a bed manufacturer).

The providers for the project were initially to be selected based on financially robustness. In practice, however this did not play such a big role. There were three points that had an impact on selection. Participants should demonstrate:

- Willingness to leave present solutions (or present paradigm) and think out of the box
- Willingness to collaborate with the other partners and assign responsibility to these
- Willingness to change technology and manufacturing procedure (for instance from steel to aluminium or carbon fibre).

The project was initially organised in cycles. In the agreement the partners committed to hand in a prototype for real-life testing every three months. The partners would receive a payment for each prototype delivered. The amount of money for the individual prototype was to be negotiated on

[14] Regionshospitalet Randers Invitation til Informationsmøde forud for udbud af Offentlig-Privat-Innovationsprojekt: Udvikling af fremtidens hospitalssæng i den moderne sengestue. Invitation letter of 5 June, 2009. http://www.regionshospitalet-randers.dk/files/Hospital/Randers/Aktuelt%20og%20presse/Nyheder-Pressemeddelelser/2009/2009%20Invitation%20til%20informationsm%C3%B8de_OPI%20projekt.PDF Accessed 2011-10-04.

the way. This envisaged pace of a prototype delivered every three months showed, at least the first years, to be too ambitious.

The budget for the project was DKK 2.000.000 which might be seen as a relative small amount. The procurers saw the small budget as an advantage, because it separated the pre-commercial development project from regular procurement contract-wise. The idea is that the same partners will be involved also in subsequent commercial phases. The budget for the pre-commercial procurement project will be spent on the creation of prototypes. Besides the project funding Randers Regional Hospital will also provide possibilities for prototype-testing with patients.

Interaction and learning

The set-up meant that the suppliers had to engage in different kinds of interacting and learning activities. This concerned all aspects of the new hospital bed, including software, design and construction. This included also interacting with firms and adoption of technologies from areas outside the hospital bed industry. Examples are suppliers of handicap equipment, as well as one large hotel chain, Scandic Hotel. This company could contribute with experiences from earlier procurements of beds for handicapped guests. Scandic's involvement was also in the role of future customer/ user. This company would also be interested in procuring the beds developed in the project. Another source of learning was the airplane manufacturer industry as manifested in the project's close contact with British Airways. The project drew on experiences made in design of chairs and beds for first class. Some technology has also been adopted from the weapons industry.

Interaction with users was also a component in the project. All prototypes will be tested with users (patients) in real-life situations. User interaction was not only used as a way of testing developed prototypes, but also as a means to get insights at the beginning of the project. One of the first actions made in the project was to set up a test patient bed at the public library in Randers. One old and one current bed were set up. This enabled members of public to test the bed and give comments. The employees at the partner companies were also invited to visit and 'work' at the hospital for a few days. This created good conditions for collaboration in the project and good understanding of the different difficulties, which can be found in the use-situation of the hospital bed.

Other experts of user-driven innovation were involved. During the project there has been made contact with anthropologists, as well as technology and process researchers from Danish Technological Institute. Both health care staff and patients have been interviewed. Some examples of issues identified in these interactions with patients are as follows: How would a bed facilitate mobility for the patient? How would it be possible for a bed to activate patients? These issues where discussed a lot among patients and professionals. This was useful because for many professionals and people within care treatment as this opened up new ways of understanding what a bed might mean from a patient's perspective.

Experiences

As was stated above, the project is still underway. Therefore is it hard at this stage to give any general conclusions regarding to what extent the project was successful. Some experiences that have been concerning the development of the project is summarised in the following.

The project was delayed nine months due to legal problems essentially stemming from lack of knowledge and experience among the lawyers assigned to the project. One general reflection reported is that "procurement agreements are time-consuming to develop". In this case it took time to find out what kind of procurement procedure to use and how to use it – as well as what kind of contract agreement to set up. The procurement procedure chosen to select partners for the pre-commercial stages of the project was the Competitive dialogue. The reason for choosing the Competitive dialogue was that it was not initially established in detail what kind of product that would eventually to be procured. Neither existed knowledge on how the final solution should work. This could only be established by entering into dialogue. The reason for choosing the Competitive dialogue was thus a perceived lack of information. This reflects a view of the Competitive dialogue as a procedure to use in order to build up knowledge in order to, at a later stage, being able to engage in dialogue with potential manufacturers. Although the Competitive dialogue has been used in Denmark before mainly in the construction industry (for contracts on infrastructure like bridges and hospitals), the lawyers who worked with this project lacked specific experience on how to carry out public procurement according to that procedure. The lawyers had to be taught about this procedure before they could give legal advice. Delays were also caused by uncertainties in relation to intellectual property. In spite of the contractual problems the collaborations appears to work well. The fact that work is continuing although contracts are still not finished suggest that there prevails trust among the partners in the project.

One reason why the process took place the way it did was because of a strong 'champion' involved in the project, the Head Nurse. She was passionate about the project and the problem it would solve. And because she (as a person) had the ability to talk to everybody – at all the different organizational levels. There was also strong political support for the project. Politically there had been a lot of attention to another large project, the development of a new regional 'University Hospital' in Skejby, a suburb of Århus, Denmark. This resulted in a number of complains and dissatisfaction from representatives of the smaller regional hospitals in the area who argued that they were neglected by the Region leaders. This imbalance in the Region created a need for focus on the smaller hospitals, and this project became one way of doing this. The change from regular to emergency hospital that Randers regional hospital was going through was also seen as one of the reasons why this project was initiated. The project fitted nicely into the currently undergoing upgrade towards becoming an emergency hospital.

For the bed manufacture the beneficial of this process is that they have gained knowledge that has business model implications. One body of knowledge concerns how hospitals operate, which is essential for design and IT people. They need to know details how doctors or nurses work, what is the logic behind what they do and what would they like to do and they are not capable today and/or if currently used equipment prevents them from doing something. The business model for some manufacturers has changed in the way that there has been an increase in the number of people working with design and technology. Firms have come to think of themselves in new ways. One example is about thinking in terms of issues or version. Currently the focus in marketing the

bed model 2012. This may be followed by a new model for 2013. Another change concerns their role as experts. Since the involvement in the project, firms are no more looking at themselves as experts on beds; they have now become aware of that it takes a partnership in order to achieve the future model of beds.

These changes have in turn led firms to a focus on more flexible products that in turn may improve market positions. There are also positive network effects for participating firms in the sense that contacts established within this project are also utilised in other projects. For instance, participating firms have found collaborators from for instance the technical institute, which they use in other as well.

On observation report concerns the tension between efficiency-based regular public procurement and public procurement of innovation. As conventional procurement departments are not initiating any pre-commercial projects, they have no experience from these kinds of projects. Therefore they could offer no help in relation to projects like this. They are driven by old paradigms like for instance: larger number = more discount, and they have a hard time thing outside these principles. This means that solutions, becomes expensive in the long run – because they lack flexibility (for instance – there are not the same demands to all hospital beds, and therefore buying the same kind for all situations means more expenses)

A final effect concerns public relations and image. For all the partners it is seen as prestigious to be part of the project and to have close contact with the other participants.

Case 3. The patient briefcase

The patient briefcase is a communication device that enables communication between the patient and medical staff at the hospital developed for patients suffering from Chronic Obstructive Pulmonary Disease (COPD), a decease that leads to a limitation of airflow to and from the lungs often caused by tobacco smoking. This portable telemedicine system consists of two components; the patient brief case and a workstation for medical staff.

Background

The project came out of a discussion between medical staff on different solutions to offer care outside the hospital. A group of physicians and nurses brought forward ideas about developing some kind of ambulating health service unit that would be able to provide health care services in the homes of the patients. The idea was based on research findings demonstrating the superiority of health care delivered in patients' homes rather than in hospitals. Dr Michael Hansen Nord, at the time Chief physician at the Medicine clinic of Svendborg Hospital in Denmark, who eventually became the champion of the project, had also received some request from people he know from earlier European projects about possible telemedicine solutions. The principal decision eventually made was to develop a solution that basically consisted of a communication line between patient and hospital. This decision eventually led to the development of the patient briefcase. The system consists of the patient briefcase that is used by the patient, and a workstation used by medical staff at the hospital.

The patient briefcase enables virtual consultation where the physician located at the hospital communicates with the patient in his/ her home (or wherever he/ she is located). The hospital-side of the system consists of a work station and three screens. At the agreed time the hospital calls the patient. A part from transmission of sound and video, the system also transfers measurement data from the patient, such as heart rate and/or blood pressure. The system offered several improvements as follows:

- Patients could be sent home from hospital within 48 hours instead of 6 -7 days. Therefore;
- Release of hospital beds and;
- Reduced workload/ reduction of workforce
- Improved health service quality as the system enable treatment in the home of the patient; as this creates
- Increased quality of life for patients and;
- Increased effects of the health care provided.

The evolution of the project is summarised in table 1. The initial ideas where formulated in 2006. Dr Hansen Nord contacted the owner of the ICT firm. He gave a list of requirements to the firm.

2006	Initial ideas
2006/2007	First patient
2007	Attention in media and among different support agencies
2008	Regional contract
2009	975 patients
2010	National contract
(?)	International contracts

Table 2. Time line of the evolution of the patient briefcase.

If one looks how the project evolved it is possible to distinguish between different phases. These phases correspond largely with phases 1-4 included in the PCP model[15], solution exploration, prototyping, original development of limited volume and commercialisation. In the first phases,

[15] See Section 2 or European Commission, 2007. Pre-commercial procurement: Driving innovation to ensure sustainable high quality public services in Europe. Brussels, 14.12.2007 COM 2007:799 final

interaction with different categories of users was a central element in the development (table 2; figure 5).

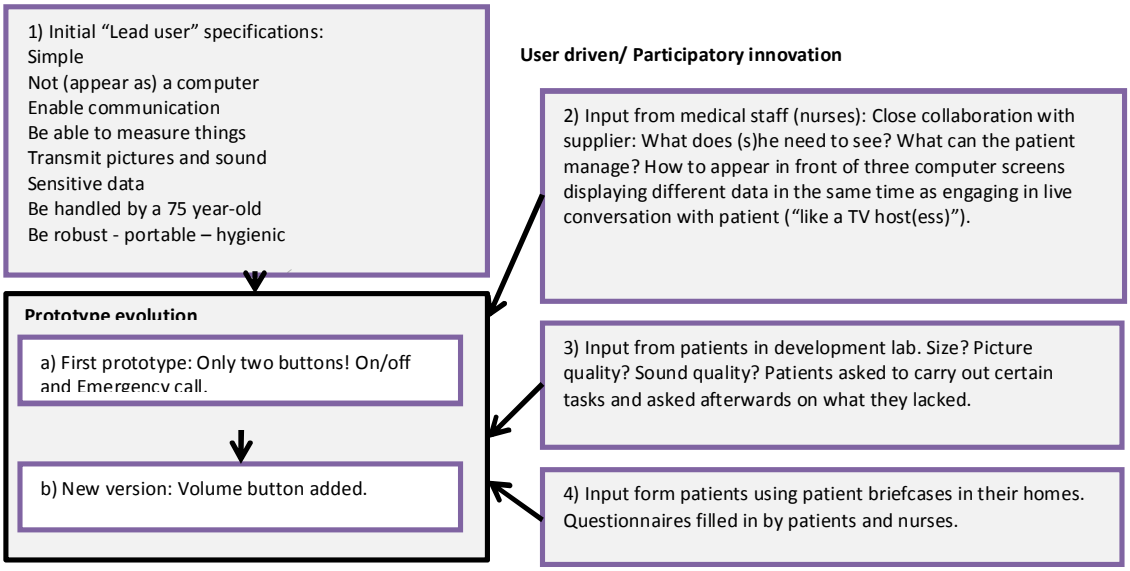
The initial specification given to the supplier was basically functional, in the sense that it described what the system should be able to do, rather than in technical detail how the system should do it. The initial question given to the developer was formulated as a question: Would you be able to do this? Requirements given were as follows: The solution should be simple, and old patients should be able to use it, it should not look like a computer, it should be water (and coffee) safe, mobile, robust and hygienic. An employee at the IT firm worked on a solution and came back some 8-10 days later with a suggestion.

In the next phase, a group of nurses were assigned to the project. These nurses collaborated closely with the supplier. All kinds of information were needed to achieve a good design. Issues discussed where for instance: What does the user located at the hospital need to see on her screens? What information is needed? What things can the patient manage? There was also an array of technical issues that needed to be settled. The developers needed to achieve an acceptable quality of picture and sound. Another issue concerned communication technology. The first version supported fixed-net communication and satellite communication.

The requirement of simplicity led to a solution with only two control buttons; one to turn the patient briefcase on and off, and one for making emergency calls to the hospital.

Then followed trials where patients were involved. Initially five patient briefcases were produced. Initial tests were conducted in a small laboratory at the hospital with a small group of patients who were asked to test the usability of the patient briefcase. Next, a selected group of patients tried to use the patient briefcase from their homes. For several weeks, several times a week, patients participated in trial consultations enabled through the patient briefcase. Both user experiences from patients and nurses were collected.

The outcome of these test activities was that the next model of the patient briefcase was given an additional control button. A part from an on/ off button and an emergency button, later versions of the patient brief case were also issued with a volume control to enable control and regulation of the sound level. Another thing discovered was the user implications for the medical staff that would interact with the patient. The new requirements were compared with the requirements of a TV host. The challenge was to be able to maintain good contact with the patient, in the same time as measurement data would appear on the screens. Other issues indentified concerned source of disturbance such as the sound of doors or telephone ringing. Initially also nurses had to re-think their conventional way of interacting with patients. For nurses, ‘conventional’ face-to-face interactions many times include physical contact between nurse and patient. Physical contact was thought of as a way of establishing trust and provide comfort. This perception has changed as the patient briefcase has been used. Today, the eye-contact enabled by the system is supporting contact. Another reflection made is that patients to large extent prepare for the consultation. The patients appears to perceive the situation as if the medical staff is actually coming to them in their homes. The patient user experience is also different from a visit at the hospital that might sometimes be stressful.



Throughout the evolution of this project the developers had to deal with some technical challenges. One of the communication solutions that the first version of the patient briefcase relied on was ADSL. The problem was that ADSL was not available everywhere. When patients who lived in areas where ADSL were not available were submitted from hospital with a patient briefcase they would not be able to receive health care through the system. When the healthcare staff contacted TDC, a telecom company, their response time for setting up an ADSL connection would be three weeks. The solution was to make an agreement with TDC to set up an ADSL connection for a patient with a patient briefcase within three hours. This is an agreements that is still in place to today. Later versions of the patient briefcase relies on 3g and other technologies. The system scans available communication lines and selects the one with best quality.

The road towards commercialisation

The first patients were using the patient briefcase at the end of 2006. In 2007, the patient briefcase rendered a lot of attention in mass media in Denmark. An array of visitors came to study the solutions, and many presentations were given. Different innovation agencies in Denmark supported the further development of the patient briefcase. The following year, the original project funding had been used. The next step of the project envisaged by the developers would have been to diffuse the patient briefcase to other hospitals in the region. It was here, however the project stalled. In spite of the attention gained in mass media and the fact that the political leadership praised the innovative project, funding required for a commercialisation was not easily accessed. The regional officials could not see how funding from the regional level could happen. The international attention the project had rendered helped the supplier to find a client elsewhere; the first contract awarded to the developer was with a county in Norway.

In this case, the firm that made the pre-commercial development also became the supplier of the commercial solution. Legal experts within the hospital organisation, on national level as well as the EU level were consulted to verify that this would be legally sound. The argument justifying this choice was that the product was so innovative and unique that no-one else would be able to

deliver something similar. The intention to sign the contract was published in Statstidende[16], an official online publication channel three weeks before the signing. By applying this procedure before the commercial contract was actually signed, any potential competitors were given a chance to come forward. If this would have had happened, a normal tender call would have been issued. As it did not happen the contract as awarded without a formal tender procedure. Since March 2010, the patient briefcase is available through framework agreement as at National Procurement Ltd. – Denmark, the central procurement agency in Denmark. The supplier has also contract with a Norwegian hospital, and perceives interest also from England. Other versions of the patient briefcase developed for other types of patients have also been done[17].

Some experiences for the Patient Briefcase

Some elements that affected the outcomes of the project can be summarised as follows:

The starting point for the project was an innovation friendly workplace. Both medical staff and the head physician who eventually became the project leader at the hospital side were open to innovative ideas given by medical staff or originating from elsewhere and willing to develop them further. Personified by Dr Hansen Nord, but also by other members of staff there was in this sense already from the start a local champion of the intended innovation.

The project involved interactive learning and user involvement that enabled innovation. Although the supplier had not developed products for this market before, they were able to learn how to apply their competence in this context. A central means to achieve this learning was the application of user involvement. Both health care givers and patients were involved, and helped to provide critical input to the final design.

The supplier was willing to take financial risks. The budget for the project was 6 -10 M DKK. DKK 1,2 Million came from public project funding, the rest from the supplier.

There prevailed trust between procurer and supplier. The initial work was carried out without any formal contracts. Obviously this could not have happened unless a high level of trust prevailed between the champion of the project and the supplier. The project harmonised well with the prevailing health care policy discourse in Denmark, to save hands, and finding ways to deal with the demographical situation where larger numbers of elderly will be taken care of decreasing number of young.

There were no natural resources for advice on legal and other formal aspects of the development project. The first months of the project evolved with a strong focus on the technical aspects of the project. After a while, however there emerged an awareness of issues such as IPR, contracts, patient data integrity etc. The developers searched for advice on these issues in house, within the region or universities. Eventually DKK 1 million was used on lawyer fees to make a contract. It may be argued that as the medical staff provided input and also were heavily involved in the usability aspects of the development of the patient briefcase, a royalty for the hospital would be reasonable. This was also a part of the initial agreement. In the second agreement that was

[16] This is (today) a website that publishes legal information and legal implications for citizens, companies, public authorities and voluntary organizations. www.statstidende.dk (accessed 2011-10-12).

[17] Press-release, Mediasat. http://www.medisat.dk/en/Start.aspx (accesses 2011-10-12).

negotiated (after the expiration of the first one) however, the contract between the supplier and the hospital was reduced to a service contract. IPR is with the supplier.

Although the project rendered an innovation not seen before, the most problematic challenges appears not to have been technological, but concerned instead haw to extend the project beyond the local hospital. It was when funding was required, and financial support from the region, that the project lost pace. The region had no organisation that would be able to support the further evolution of the project. The project involved business model innovation. The exchange mechanism eventually chosen was to leasing the service, not procurement of a product. One reason for leasing rather than procuring was to be able to stay updated with the technological development.

There prevailed a lack of understanding for dealing with the public sector. Compared to conventional business-to business interaction, the supplier perceived the public partner as slow. Slow decision processes within the public administration. There prevailed also a lack of understanding in relation to public requirements of certain documentation.

A general reflection that emerged in the interviews concern the viability of projects and the possibility to terminate projects that turns out to be less promising. A general recommendation that emerged in the discussions of this case is to consider implementation/ diffusion of the final product already at the development stage. For all projects there should be built in a half time evaluation mechanism and an implementation plan. This evaluation should be set up in a way where one option is to close down projects that are judged as unviable. One could instead then use freed resources in other more promising projects.

An innovation may be an innovation in different ways, and also have different effects. Some characteristics of the patient briefcase can be summarised as follows. The innovation emerged as response to local demand. It was a product innovation. It was also a process innovation in the sense that the introduction of the patient briefcase made possible a new way of delivering health care services to patients. Another aspect of the process innovation aspect of the patient briefcase was the effect on as similar ideas developed in other countries in parallel with the developments in Denmark, and it is unclear to what extent one can talk about an innovation understood as new to the world. Certainly the patient briefcase was news to the Danish context.

Case 4. HealthLab: Tsaar Peter

amsterdam region zorg en ict health-lab.nl www.health-lab.nl

This case study describes the procurement and implementation of new technologies that enable elderly people to be longer self supporting. For this procurement a Living Lab setting is being used to make sure adaptation of new technologies will be realized.

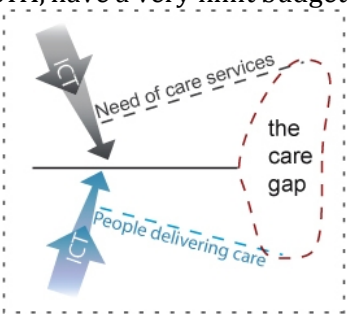
Background

AMSTA is one of the four largest Health-care institutions of Amsterdam. With the increasing demand for HealthCare due to an ageing society and declining availability of capable staff AMSTA decided it wanted to apply new technology to help them to solve this growing problem. One of the challenges they predicted was the difficulty around the adaption of technology by elderly people.

Normal procurement of technology was not possible due to two causes. First of all they did not exactly now what technology was available and what was needed to implement the available technologies, due to the fact that their "customers" were not pro-active in adopting "changes" to their daily life. Secondly they couldn't see what the use of technology meant for their processes and the requested skills from their employees.

AMSTA's Leo Versteeg was appointed to find a way to decrease the workload and increase the customer satisfaction by using technology. The new to build location of AMSTA, "Tsaar Peter" was considered to be the right place to do this, because in the architecture of the building it was still possible to make small changes if needed. The building of Tsaar Peter started in 2010 and it was planned to be delivered in august 2011.

In discussions with the VU University in Amsterdam and other knowledge institutions AMSTA decided to make their new building a living lab, where from the start the effect of technology was measured. Since most health care institutions, including AMSTA, have a very limit budget they wanted to make immediately a business cases in savings.



The second challenge, how to make sure their employees have the proper skills, was engaged in collaboration with INHOLLAND, an educational institute. INHOLLAND will join the project and together with their available new courses are being developed ánd applied in their standard curriculum, to make sure the use of technology will be part of their educational process.

Together with the VU university, Waag Society, INHolland and AIM a Living Lab was designed and suppliers of technologies like sensoring, video and app's were initiated to demonstrate their solutions. A panel of elderly living at Tsaar Peter and a broader panel of elderly was established.

Because of the relatively high costs of organizing a Living Lab that was envisioned other care institutions were involved the join the Living Lab experiment, so costs could be shared.

Project Objectives and Benefits

- Increase the quality of care and decrease the request for (not available) staff in the future.
- To pilot the use of new technologies before a further roll out within the Amsterdam Metropolitan Area to avoid investments that would not be a success.
- To involve senior citizens in the integration and implementation of new technologies and make sure the adaptation of new technologies was secured
- To make a business case in a real life environment, realizing that health care institutions have limited budgets

- To include the education of current and future employees with regards to the use of innovative technologies and solutions.

Why is this project to be considered as pre-commercial procurement?

The client, AMSTA, had a sense of urge with regards to their health care ambitions due to the problems they were facing with the Care Gap. They did not know exactly what solution would be most effective and wanted to avoid a technology push. In teaming up with a knowledge institution and the design of a Living Lab they managed to find an Open Innovation-model to develop custom made solutions.

In comparison, a regular procurement process works in a rather straightforward way. The customer has a need that corresponds with something already available on the market. Most aspects of the procured item is well-known, and the primary variable that determines selection of a certain product is price.

Figure 6. Normal procurement process

Here the situation was different. Within this project there was no clear solution defined. By organizing a living lab (together with a knowledge institution) and involving several suppliers the potential solutions where eventually defined. Based on these results further procurement for other locations will be executed. To do this R&D budget of the VU university combined with a economic subsidy was used.

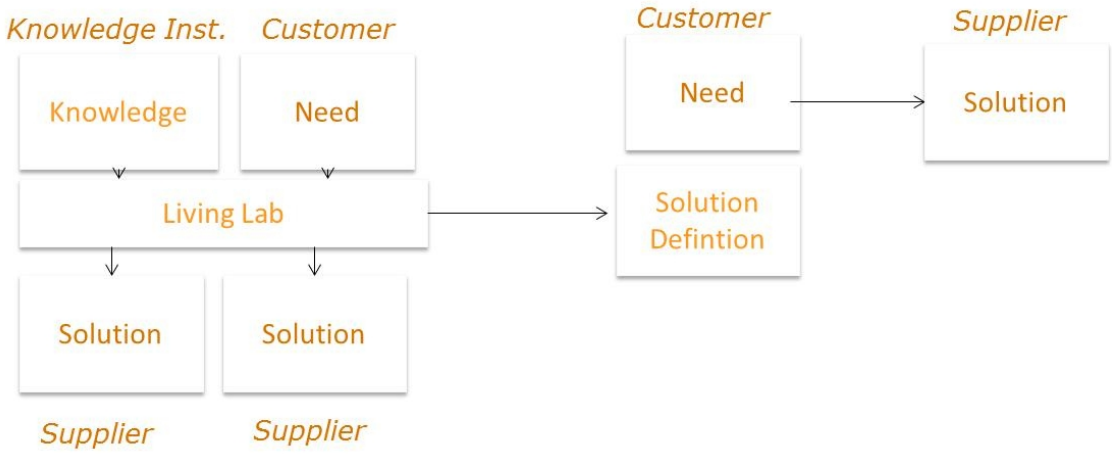


Figure 7. Health Lab procurement process

Besides this there was an educational institute involved in this project to make sure the knowledge being gathered about the use of technology andthe adaption of senior citizens was used to make learning modules. The results of the integration of new, or customized, products are being actively shared with other institutions to help them to choose solutions easier.

Project Tasks

	Task	Results
1	**Organize user groups and define needs**	Stakeholder groups with definition of needs
2	**Design of Living Lab**	A running Living Lab, including Living Lab methodology and effect measuring instruments
3	**Research questions**	Based on the definition of needs several KPI's and research questions defined
4	**Executing pilots**	Testing of several solutions in Living Lab with close monitoring of results.
5	**Conclusions**	Lessons learned and best practices. Including business cases.

Pilot Cost Estimation

For the execution of this project a broad consortium was gathered. Potential suppliers were asked to demonstrate their solutions for free with the forecast that their solution would chosen to be used in a broad implementation.

The costs for this experiment are about 450.000 euro's, but the Living Lab can be used for several experiments. Investment of AMSTA is about 90K, VU University 90K and the rest of the funding is subsidized, also in collaboration with the other Health Care institutions.

First business case: by using sensoring in a proper way, the night shift can be twice as efficient. Saving 150-175K on an annual base.

Project multidisciplinary team

Multidisciplinary knowledge and skills are the essence of a procurement process where innovation is the essence. In this project organizing the Living Lab, the involvement of user groups (patients, care taker and relatives of patients), knowledge of care, knowledge of ICT and the ability to make business models required a very multidisciplinary team.

Part of this team was the VU University – department of Social Sciences, a user group of 10 patients, Waag Society for the design of the Living Lab, the local government for exploitation and disseminations, AMSTA as a client and the employees of AMSTA. Also INHolland was involved in this project.

Selected Suppliers

The project is still running and not all suppliers are selected. The supplier for sensoring is selected and we will use this example in this case study.

Selected supplier 1: Innovating

Innovating is a SME that is established in 2006 and is specialized in the use or sensors. Within this test-bed that have developed a system where the movement of elderly people was monitored in a very detailed way. The effect of their solution is that during the night the care takers can do "one round" less through the institution while maintaining the same safety. This means a business case between 150 and 175K on an annual base. The investment for a system in all buildings I about 250K, so the return on investment is only 1,5 year.

Innovation developed during the pilot

Sensor technology is a proven technology. The involvement of patients and care takers has led to several adaptions in the product and service around the sensoring. During the interaction of this project the following innovations were made to the "proven" sensor technique.

- Development of an interface that was friendly for care takers, with not too much information, but enough information to create an own insight
- Development of an interface and emergency system for patients that wanted the feeling of security on same level that was when care takers were walking around the perimeter.
- Software that analyses the difference from night to night so differences could be noticed and prediction on incidents could be developed (currently under development)
- The process of night watch is being analysed and together with the care takers, other tasks have been altered and their work pressure has been lowered, also because the person that is physical around every night can do other tasks, preparing work for their colleagues.

Conclusions

The case HealtLab Tsaar Peter case has been a good example of how Living Labs can contribute to the procurement of eHealth solutions and applications. A first success can be found in the procurement of a sensoring system, also for other locations.

- Intention: to procure technology that helps to decrease the care gap
- Partners: AMSTA, VU, Waag Society, HVA, Amsterdam, AIM, user groups
- Objective: to create an environment where new solutions can be piloted and co-developed
- Timing: From 2009 to 2011 in creating the Living Lab, now continue

The selection of the approved and innovative solution and the whole process of the project cooperation include the majority of the phases of the so called Pre-commercial procurement of innovation, based on the typical research and innovation life-cycle, transforming an idea into a product/service. Direct benefits are:

- By collaboration relatively low costs before implementation
- Very successful adaption of users
- Inclusion of education
- Joint innovation with industry and thereby pushing private sector investment in innovative solutions.

Case 5. Welfare-technology neighbourhood: robotic vacuum cleaner and the electronic keys

The vision behind the project called "Welfare-technology neighbourhood" was to use a neighbourhood in central Copenhagen, Denmark as an Innovation Exploratorium for testing potential welfare-technology in the homecare sector. Ethnographic research identified two areas with distinct potential for testing welfare-technologies. The first one was linked to the elderly people's wish to keep their home clean and neat. The welfare-technology tested for that purpose was a robotic vacuum cleaner. The second area was linked to the elderly people's wish to get quick help in case of an emergency. The welfare-technology tested for that purpose was an electronic key that could give the caregiver immediate access to a citizen's home in case of an emergency by receiving an entrance code on his/her mobile phone.

Background

Based on an earlier project, the healthcare system in Copenhagen had a wish to create a short term project that could specifically focus on welfare-technology. The underlying rationale for the project was the perceived need for innovation: The health authorities were in a situation where obligations and assignments were getting bigger and the number of 'warm hands' to fulfil them were less and less. Consequently, the Innovation Centre Copenhagen (ICPH) and the healthcare administration created the project together and applied for funding.

In Copenhagen, the home healthcare system is organized in 'neighbourhoods'. The homecare neighbourhoods used to be managed by the healthcare personnel who provided the health care services. This meant that for each patient, the health care personnel would assess the need for help and perform the health services judged to be needed. The advantage with this system was that it was very flexible. The disadvantage was that decisions on what health services were delivered was based on subjective judgements made by individual members of staff. This made it impossible to create a standardized service level. Today, the healthcare personnel are divided into medical officers and health care workers. The medical officers are often nurses whose task is to assess the need for help based on some established service standards. For instance, at the most, the municipality provides vacuum cleaning every 14th day and in an area no larger than 65m2. The health care workers provide the actual homecare services. The new healthcare model made the health care workers feet that they were no longer able to provide the care and attention they think is necessary. They also complained that with the new model they became busy with practical tasks. As only practical actions were taken into account in the assessments, the health care workers could no longer spend quality time with the elderly because the elderly could only be assessed to practical care. This also created the phenomenon of comfort-vacuuming.

The intention with the project was, therefore, to use ethnographic studies and workshops to identify areas where new welfare-technologies could take over of some of the practical care functions in order to leave more time for personal care and solicitude. The healthcare administration was also interested in the project because it could help to map what different types of citizens lived in the neighbourhood, as well as views on the limits to self-sufficiency in the area of homecare.

The project, partners and selection mechanisms

The "Welfare-technology neighbourhood" project is collaboration between the Copenhagen Municipality - the Department for Health and Care and Innovation Centre Copenhagen (ICPH). The project was based on a wish from the Municipality to impact the development of welfare technology products and services for elderly people. The objective of the project was to use welfare-technology in the municipal homecare in such a way that it would:

- Enhance the citizens self-sustainability
- Enhance the employee's working conditions
- Municipal time is released

The project was, on purpose, set up as a development project and not as a procurement project. The last was, mainly, because the project managers wanted to be sure that the companies/suppliers would be part of the project to use insights and tests for further development and adaption of their products and not only to secure a large order. Also, the public system was very hesitant to make a pre-commercial procurement contract because it was afraid to make a distortion of competition and, thereby, to break the law. However, at the end of the project, the selected companies expressed a wish for a pre-commercial procurement contract. So, they could ensure their investment in the development project showing the public healthcare system's willingness to take risk, as well.

Suppliers were selected on the basis of: 1) willingness to invest time and resources in the project; and, 2) willingness to adjust to the public and organizational project setup. But, they were not paid; instead, they were invited into the homes of the elderly citizens to have their products real-life tested.

Interaction and learning

Both the robotic vacuum cleaner and the electronic keys had been used before; however, by June 2008, none of them had been used in the context of elderly people. Initially, the robotic vacuum cleaner was tested in the way it was. The electronic key-system was not changed but incorporated into the caretakers' mobile phones.

All products and alterations from the project were tested with users such as elderly people and caretakers in real-life situations – as well as in the organizational set-up. Moreover, citizens from the neighbourhood were invited to give their insights on the project at an open meeting. Also, during the project, a number of ethnographers were involved, firstly, to identify the main problem areas and, secondly, to conduct the real-life cases.

The interaction with users, citizens and ethnographers provided a clear priority of the product's attributes and a significant understanding of the services, systems and situations surrounding the products. It was found that the robotic vacuum cleaner needed to have another interface and the keys were simply too small. For instance, there were a number of aha-experiences in which some of the elderly people's homes are covered with carpets and that could be a challenge for the robotic vacuum cleaner. It was also identified that some features in the vacuum cleaner needed to change. The last was because in all standard robotic vacuum cleaners, it is assumed that people are out of the house when the robot cleans. However, in the ethnographic research, it was noticed that the elderly did not leave their homes when the device was running. Instead, they created some kind of relationship (interaction) with the device (robotic vacuum cleaner) and started to give names to it, for example, "the small helper". Some elderly even applied a personality to it. It was also evident that the elderly people would like to have control over the robotic vacuum cleaner; so, it enables them to clean the house by themselves and, consequently, do it in the way they want it. This has led to the idea of a remote control to the robotic vacuum cleaner.

Problems or barriers encountered

During the project, there were mainly two issues: 1) in the beginning there were some logistics problems that were preventing the companies from having access to the elderly people's homes; it needed some more arrangements; and 2) the group of managers were not involved from the beginning of the project, so, this created resistance and anxiety in the group of employees. This has taught to always involve all levels of management in such projects.

The primary reason why the process took place in the way it did was because there was a strong and narrow vision of the project and a constant focus on quick wins. Furthermore, the outcome of the project have been real-life tests of two welfare-technologies and gain of knowledge on how those can be adjusted to the systems and its needs. And, especially the manufacturer of the robotic vacuum cleaner has benefited from the project because it has changed the supplier's understanding of the product in this market, and, it has changed their perspective on development – from something thought of as happening in a R&D lab to be something that take place into contact with real-life situations.

A final remark concerns to the decision not to carry out this project as a pre-commercial procurement project. The reason why the authorities were reluctant to make a pre-commercial procurement contract was that they feared this would distort competition and, that they would thereby, potentially risk breaking the law. Another barrier in this case was then a lack of knowledge concerning available methods for public procurement of innovation, especially pre-commercial procurement.

In October 2011, the Autonomous Province of Bolzano / Bozen, Italy, also known as South Tyrol, launched their first PCP "Closed Loop" call for tender to get radiotherapy appliances developed and supplied.

Case 6. The case of radiotherapy appliances

One of the first Italian examples of a true pre-commercial procurement call for tender to be set up, the PCP call can be downloaded from the Bolzano Province official website www.bandi-altoadige.it along with all the relevant documents, forms and guidelines for participation. Available both in Italian and German, the call for tender has been set up according to the specific point of view of the local administrators and shared with the DG Information Society and Media of the European Commission.

This specific PCP call does not exactly match the four stages of a classic PCP scheme, even though such a scheme supplied local officers with important guidance during the development of the call. Indeed, once the public administration have managed to obtain a pre-competitive technical solution, the PCP call for tender will allow for the private company to skip one or two stages and jump directly to the prototype creation stage. In this specific case, the prototype will be tested by the Bolzano Hospital together with the selected private company/ies, in order to get directly to the definition of the prototype itself.

This specific approach has two advantages:

1) Time reduction between definition and needs of the performer on one side, and setting up of the prototype on the other side;

2) Less bureaucracy in project proposal evaluation;

3) More added value given to public buyer's skills, as these ones will be used in all project planning and prototype set up phases.

To a closer inspection, it looks like as the call was built starting from an RTD approach instead of a pre-competitive one. However, we should bear in mind that the pattern proposed by the European Commission is a flexible one and can thus be adapted to single cases every time in a different way. Indeed, a good project proposal and its implementation should be closely linked to its cheapness, that is a favourable benefit/cost ratio. The lack of an expense cap and a clear definition of eligible costs would allow for inexistent and undocumented costs to be funded, thus causing a loss to the public administration.

Legal premises

According to law n. 14 of 13/12/2006, the "Assessorato all'Innovazione" (Councillorship for Innovation) of the Bolzano Province is competent to grant "state aid" contributions and loans to those enterprises developing research, development and innovation projects. Such a law has been notified to the European Community with Act N466/2007 and has been validated with a letter from Mrs. Neelie Kroes of 18/02/08 – ref. D/299675.

Within the framework of this law and its criteria, the "Assessorato all'Innovazione" can also promote collaboration projects between private enterprises and public research units.

The "Assessorato all'Innovazione" – willing to promote the implementation of COM(2007) 799 "Pre-commercial Procurement: Driving innovation to ensure sustainable high quality public services in Europe" – set up a pilot project between a private firm to be selected through a specific call and the Public Health Unit of Bolzano (Comprensorio Sanitario di Bolzano).

Functional needs analysis

The "Assessorato all'Innovazione" has carried out a research programme on local specific needs and, amongst all the proposals that have been submitted, a particular one called "Closed Loop": Advanced automation and management of the clinical risk and trials in Medical Oncological therapy has been selected by the Public Health Unit of Bolzano.

PCP project players

A) Bolzano Province Councillorship for Innovation

B) Public Health Unit of Bolzano – Oncologic and Pharmaceutical Units

C) A private company to be chosen through a call for proposal

A) The role of the "Assessorato all'Innovazione"

- to prepare a call for proposal (forms, financial sheets, work package schemes) to choose the private partner cooperating with the Public Health Unit
- to establish an evaluation scheme and a call procedure
- to evaluate the proposals with a technical committee
- to draw a contract to be signed by the private partner and the Public Health Unit
- to check periodically the "state of the work" of the project and the eligibility of expenses
- to finance 100% of the costs supported by the Public Health Unit of Bolzano and 70 % of those supported by the private company (co-financing for the remaining 30%)

B) The role of the Public Health Unit of Bolzano – Oncologic and Pharmaceutical Units

- does not contract out any predefined solutions
- exploits internal research and experimentation units
- exploits, for further research activities, the research and innovation budget obtained by royalties on prototype

C) The role of the private company

- covers a variable percentage of risk
- shares future incomes with the public body
- improves its image indirectly thanks to the cooperation with the public body

Case 7. Stabilising splints for fractured neck of femur

In summer 2009, thirty representatives of front-line staff and end users from the English, Welsh and Scottish Ambulance Service identified a number of important clinical needs within the service. One of those needs was for a splint to immobilise a Fractured Neck of Femur (FNoF). FNoF is a condition that affects mainly the elderly and is often the result of a fall. The condition is very painful for the patient and prognosis is poor, with significant follow-up Health and Social Care costs. Fractured joints are typically stabilised by a splint, but existing splints are too complicated, difficult to fit quickly and often fail to immobilise the hip joint successfully.

Step One - Define the Need

The key representatives of the national Ambulance Services identified the problems like this:

"The existing splint is too complicated to use, there are too many straps, and bits tend to go missing. If all the bits are there and they can get it to fit properly it does little to stabilise the patient over rough terrain or when moving them. If they can't get it to work in ten seconds they won't use it, especially in emergencies (known as the 10 Second Rule). There is recognition that getting an elderly person down three flights of stairs in a cluttered house with no working lights is exactly why a better splint is needed, especially when you combine this with the existing carry chair which does little to help the situation."

They were then asked to consider and complete the phrase 'Wouldn't It Be Great If…..' Here's what they said:

"Wouldn't It Be Great If…. we had an easy to use/re-use mechanism for moving patients with a fractured neck of femur which would self regulate/stabilise whilst the patient was in transit and help protect the patient from further injury to an already painful complaint."

The group went onto identify attributes in four categories:

- Features of the innovation. The group identified eighteen design solution attributes. Of these, the priorities included "the splint should be lightweight but with shock absorbing properties, it should have the ability to be deployed over clothing if required and it needs to be x-ray clear."

- Business opportunities. The group identified nine business opportunities. Of these, the priorities included "large numbers of Ambulance Trusts would purchase the splint, the kit could span other areas such as Orthopaedic post-op recovery and budgets for development could be available."

- Research requirements. The group identified eleven research requirements. Of these, the priorities included "early economic assessment would be needed, prior art and the evidence base for adoption".

- Enablers. The group identified 16 enablers. Of these, the priorities included 'independent device development partners, IP and funding'.

At the end of the Phase 1 Design, a stage gate design review was held, facilitated by the NIC and attended by the clinical leads. At this stage a group decision was made regarding the most suitable design. This was based on ease of use, patient comfort and manufacturing costs.

Step two – Design the solution

After prioritising the attributes, the NIC ran a competition inviting firms to apply to design and develop the first prototypes. The response from both commercial organisations and individual innovators was high and, from these expressions of interest, the NIC selected two development partners. Front line staff who had been involved in identifying the need were also involved at every subsequent stage. This enabled designers and developers to get immediate and on-going feedback from the end users.

Phase one funding was £45k in total. Having subjected the designs to a detailed stage gate review at the end of this phase, one organisation was selected to progress the design. At this point an award of £80k was given to further the development of the design and this was supplemented by a further £90k to redesign the patient pathway and prepare for ethics and trials approvals.

The use of a phased approach such as this helps to reduce risk for the commissioning authority. For example, if an innovation is not developing as expected, the NIC is able to halt further call-down on cost and time resources using a staged competition approach.

Step three – Develop the opportunity

This phase of work included the assembly of initial prototype models. This enabled clinicians to have a 'look and feel' of the product and provide valuable inputs to the prototype design. These prototypes also helped enable key decisions to be made regarding the most suitable design to proceed. The prototyping also helped early stage production costs to be considered in conjunction with further areas of cost reduction.

A key element in the NIC's process was to encourage open collaboration and spread the work to the most appropriate party. As a result, one of the design houses that had won the contract successfully joined forces with a further external designer. The entire project was managed as an integrated programme of work, using on-line toolsets to share ideas and report on progress. The project work plan was split up into deliverables and underpinned by a strong governance structure. In some cases, additional resources, such as workshops, were supplied by the NIC.

Step four – Demonstrate the benefit

Stringent regulatory and ethics approvals are required as part of clinical trials for Healthcare technology products.

The NIC then brokered an agreement for trials between the successful design house and a clinical lead in the NHS. Working with the Chair in Orthopaedics at a local university, the trial also included an assessment of how the device would affect the patient pathways. Autumn 2011, fifteen prototype units began a three-month trial across an NHS Foundation Trust region and the local Ambulance Service.

Step five – Distribute the product

In Spring 2012, the trials programme will conclude. A fully detailed report will be produced to support the trials outcomes and recommendations. Any changes to the design will be considered

and incorporated via a disciplined change control process. Once base-lined for manufacturing, tooling, production and distribution networks will then be enabled and initial batch production will commence with delivery into service Early planning of the production programme is key to ensuring the correct manufacturing channels are set up and agreed. This will mean that, as demand increases, the appropriate number of quality-assured products will be available across the NHS.

The most senior member of the English Ambulance Service nationally, Chief Executive of the London Ambulance Service, Peter Bradley, has supported the Ambulance PCP approach from the outset. In August 2011 he said: "When I was approached by the NIC I was happy to lend support as the need for improved clinical equipment for ambulance crews was self-evident. I was especially drawn by their philosophy of involving the end-user in the design process and was curious to see how things would unfold. So I must say that I'm delighted at the direction the project has taken. It's great to see front-line ambulance staff from three different ambulance services involved in technology-based projects aimed at improving patient care. So, like everyone else, I'm looking forward to seeing the new products in action!"

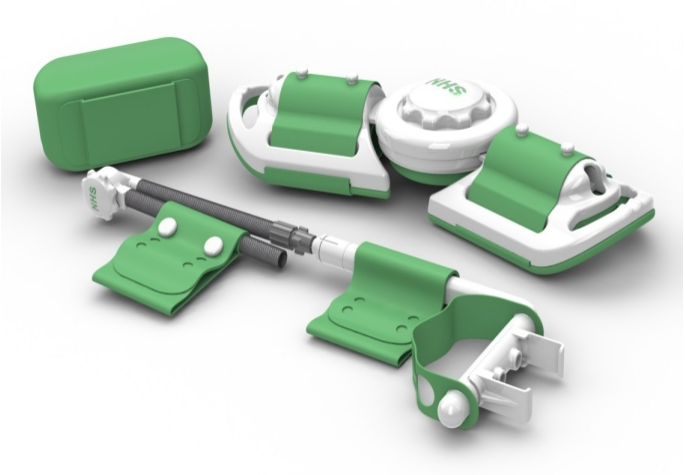


Figure 9. Device to stabilise a Fractured Neck of Femur

On alternative Procurement Measures

It is important for member states to view PCP in relation to other means to stimulate innovation and also to consider to what extent there are other methods that might be useful or even preferred in certain situations. For that purpose it might be useful to look at the basic rationales for innovation policy in general, i.e. promoting innovation for the purpose of achieving economic growth. Essentially this builds on the understanding that by innovating, a firm can present a better product on the market, or produce it more efficiently than its competitors and thus achieve competitive advantages. In order to stay competitive in the long run firms must continuously evaluate their activities to seek out possibilities for innovation. Public agencies on different levels can and may want to support and promote firms' innovative activities. This is achieved through "knowledge policies" developed to promote e.g. scientific progress or development within a specific sector in order ultimately to stimulate innovation. The explicit emphasis on 'knowledge' underscores that innovation policy builds on "many different sources of knowledge and that innovation itself is a learning process" [18].

The scope of the current report excludes a more elaborate discussion on the instruments which e.g. national governments may include in their innovation policies. In brief, one could however distinguish between three main categories of innovation policies: environmental, supply-side and demand-side measures[19]. Examples of environmental measures are tax allowances for firms engaging in Research and Development (R & D) or intellectual property laws that give firms monopolistic rights to commercialise a product developed by a firm. Supply-side measures are typically research infrastructure provided by public agencies, for example public provision of scientific training, public laboratories and R & D grants. Public procurement is the central component in the demand-side category [20] [21] [22]. To importance of creating demand for innovation, is the cornerstone for promoting public procurement as an innovation policy instrument, and have traditionally, as was mentioned above not been utilised fully.

The previous paragraphs allude to some points relevant for a discussion on alternatives to PCP as follows. The initial one is derived from the fundamental assumption that innovation in general takes place in firms. This means that PCP, like any forms of innovation instruments, should be employed only in situations of system failure, i.e. in situations where suppliers for whatever reason hesitate to get involved in innovative activities. It has also happened that the market has over time changed to eventually provide a more efficient stimuli to innovation, than any public policy instruments could offer. This happened for example in Sweden in the 1980's, where a

[18] Lundvall, Bengt-Åke and Borrás, Susana 2005. Science, Technology and Innovation Policy in Fagerberg, Jan, Mowery, David C Nelson Richard (Eds.), The Oxford Handbook of Innovation. Oxford University Press. P. 625.

[19] Rothwell, Roy 1981. Pointers to government policies for technical innovation. Futures. June.

[20] Braun, E. 1980. Government Policies for the Stimulation of Industrial Innovation Technology Policy Unit, University of Aston in Birmingham. In Rothwell, Roy. Pointers to government policies for technical innovation. Futures. June.

[21] Geroski, P. A. 1990. Procurement policy as a tool of industrial policy. International review of applied economics, 4. 2, 182-198.

[22] Edler Jakob and Georghiou, Luke 2007. Public procurement and innovation - Resurrecting the demand side. Research Policy, 36, 9, 949-963.

national project aiming at developing a computer to used by schools had to be terminated, due to the emergence of MS-DOS compatible computers offered at a lower price [23].

Viewing PCP is one of many possible policy instruments members states may invoke, underscores the complementary dimension, i.e. that PCP can be seen as one element to be used in conjunction with other instruments. One example is the development of master plans, as seen typically on sub-national or municipality levels. A master plan includes typically a strategic long-term plan while in the same time being rather concrete in terms of envisaged outcomes. In relation to the master plan PCP becomes an instrument to implement elements in the master plan. A development project can also consist of a combination of different kinds of procurement processes serving to allocate consultants and specialist. PCP can also be used in combination with supply-side measures as well as environmental.

Although PCP has a lot of promising features PCP should not be considered as an any-situation procurement tool. Procurers should be "aware that PCP is not concerned with the procurement of existing products or services on the market, but with the R&D phase of a product or service before its (potential) commercialisation. As such, the PCP is not concerned with quantity production, customisation of existing products or other commercial development activities.[24]" Also, even if a procurement project renders innovation, that may still not exclude other forms of public procurement of innovation than PCP as the preferred option. Factors such as the knowledge level held by the procurer and the maturity level of the procured technology may make traditional forms of public procurement of innovation a more sound choice. This way of thinking has been applied for some years now by the Flemish Government and implemented by the Flemish Innovation Agency (IWT). Public procurement of innovation takes place following political ambitions as implemented in master plans. The master plan includes "an analysis of the actual situation with regard to a socio-economic problem or a public service that has to be improved"[25]. This is further concretized in innovation platforms. Here also the mix of policy instruments found to be most desirable to achieve the outcome foreseen in the master plan is laid out. By applying the Hommen matrix as a selection tool, procurers may choose either PCP or more conventional approaches as a tool to achieve innovation[26],[27]. The IWT model is showed as figure 9.

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[23] Kaiserfeld, T. 2000. A case study of the Swedish public technology procurement project "the computer in the school" (COMPIS), 1981-1988. In Edquist, C., Hommen, L., Tsipouri, L., (Eds.) 2000. Public Technology Procurement and Innovation. Boston / Dordrecht / London: Kluwer Academic Publishers.

[24] Lucas, Rebeca and Vulcano, Antonella, 2011. PCP Manual A Practical Guide To Pre-Commercial Procurement. Innovative PROcurement techniques to support the GRowth of competitiveness for public services in EASTern Europe (ProgrEAST). Work Package 2 - Deliverable 2.1, Contract Nº 248352.

[25] Ibid. p. 37.

[26] Rolfstam, M. 2005. Public Technology Procurement as a Demand-side Innovation Policy Instrument - an Overview of Recent Literature and Events DRUID Winter Conference Skoerping/ Aalborg, Denmark

[27] Bodewes, Hanneke, Hargeskog, Sven-Eric, Müller, Lysann, Ottolander, Michiel, Thevissen, Peter, Veys, Christophe, Widmark, Nina, Rolfstam Max, 2009. Exploring Public Procurement as a Strategic Innovation Policy Mix Instrument. OMC-PTP Project. Funded within the 6th Framework Programme of the European Commission.

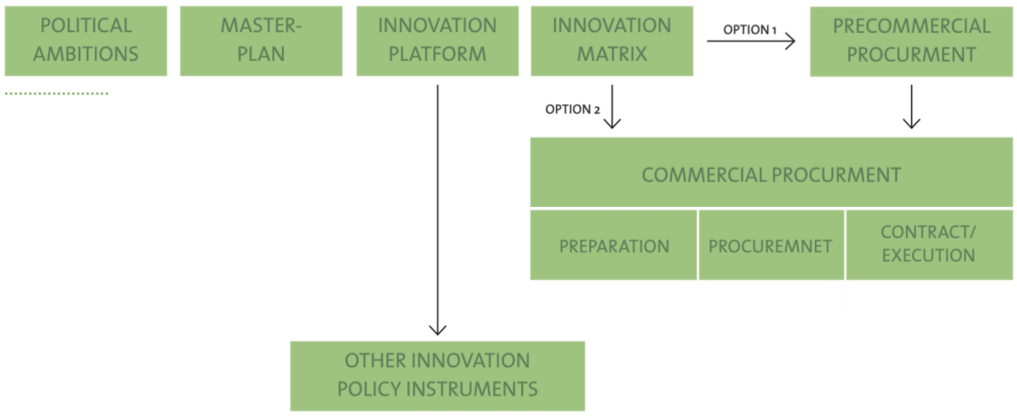


Figure 9. The IWT model of public procurement of innovation

One general problem with implementing innovation policies has to do with the principles on which specific policies are selected. Inspired by success stories elsewhere, policy makers often attempt to copy these successes into their own domains. This borrowing of 'best-practices" has been questioned in the context of policy making for Asian economies in transition[28]. Similarly, authors writing about regional policies maintain that "successful borrowing or copying of a single institutional idea is quite difficult to achieve, since it is often the case that the imitated institution will not function in the same way in the context of another institutional set-up or configuration"[29]. Scholars have also argued that "[i]t would be misleading … to conclude that innovation activities required to secure competitiveness are the same in all kinds of areas"[30]. From an institutional perspective where nations can be understood to manifest national contexts developed according to system-specific path-dependencies it would not be a far-fetched expectation to encounter context-specific concepts and procurement traditions (e.g. Hollingsworth 2000, p. 621). To make European innovation policy match with local contexts one should therefore apply a subsidiarity principle in the attempts to diffuse PCP among member states.

One example of an alternative method for enabling innovation encountered in this project is 'public private innovation'. This is a well-established term in Denmark used to describe learning activities taking place in collaboration between a public agency and research organisations and/or private firms. One central component of public- private innovation projects is the access to users provided by the public partner. This creates possibilities for suppliers to try out prototypes for instance with real patients. These projects typically create new knowledge for the supplier useful to develop further the prototype. In that sense they may also lead to innovation. There prevails however not any expectations that these projects should eventually render commercial procurement, which is of course a weakness.

[28] Lundvall, Bengt-Åke, Intarakumnerd, Patarapong and Vang, Jan 2006. Asia's innovation systems in transition: an introduction. In Lundvall, Bengt-Åke, Intarakumnerd, Patarapong and Vang, Jan (Eds). Asia's Innovation Systems in Transition. Edward Elgar. Chelenham UK. Northamton US. P. 16.

[29] Eriksson, Marie-Louise 2005. Organising Regional Innovation Support Sweden's Industrial Development Centres as Regional Development Coalitions. Department of Technology and Social Change, Linköping University. PhD Thesis. P. 53

[30] Tödtling, Franz and Trippl Michaela 2005. One size fits all? Towards a differentiated regional innovation policy approach. Research Policy. 34, 1203-1219. P.1204.

To some extent this problem prevails also in PCP. The possibilities for procurers *not* to proceed to a full commercial procurement, which is a good feature in terms of risk management, may also become problematic, in the sense that the PCP model does not guarantee that commercial procurement actually takes place. If a PCP process does not go through also the commercial step, it would mean that it does not work to create demand for innovation. The focus on the pre-commercial aspect of an innovation's life cycle also tends to neglect one aspect that might be as important for successful commercialisation, namely diffusion. Even for innovative products developed elsewhere may be very hard to introduce to an organisation due to endogenous institutional barriers[31].

[31] Rolfstam M., Phillips, W., Bakker, E. 2011. Public Procurement of Innovations, Diffusion and Endogenous Institutions. International Journal of Public Sector Management, Vol. 24 No. 5.

Appendix 2. EEnergy Best Practice Cases

CASE 1: SOLAR XXI BUILDING [PT]

Solar XXI was built in 2006 and is considered a highly efficient building, close to a net zero energy building, because the difference between the energy consumed and produced is 10% of the energy consumed by a standard new office building. This building is an example to designers, builders and promoters, proving the concept that it is possible to have energy efficient buildings with renewables integration (namely BIPV) without over costs.

This project stresses the role of solar energy (Thermal and PV) in buildings, decreasing operation (namely energy) costs of buildings as well the decreasing of CO2 emissions in the building sector.

Its main objective was to promote the reduction of energy consumption for lighting, heating and cooling through an appropriate design and construction. Some of the innovative aspects of such a project are:

- Integration of rooftop and façade PV for electricity production;
- Solar thermal collectors for heating;
- Maximize the use of natural ventilation and natural lighting;
- Trombe walls for passive heating and cooling of the building;
- Buried pipes used for ventilation generate geothermal passive heating and cooling.

CASE 2: PPEC – CASCAIS EFFICIENT TRAFFIC LIGHTNING SYSTEM [PT]

Included in the Program for the Promotion of Energy Efficiency (PPEC), the Intelligent Traffic Lightning system project aims to implement an electric system that reduces the electricity need and the reduction of costs and CO2 emissions for the traffic lightning management system. The municipality will promote the substitution of incandescent lamps for LED in all traffic lights of the region, with estimate savings of 90%.

The study carried out and the tender process for the acquisition of the LEDs can be by itself a best practice case since there is clearly an innovative component in optimizing the traffic system of the city. The public tender requirements require innovative solutions to be integrated and implemented.

CASE 3: ELECTRIC CONSUPTION MONITORING SYSTEM FOR SEVERAL PUBLIC BUILDINGS [PT]

A system that allows the monitoring of Public Buildings within the Municipality of Cascais, having a business intelligence system that allows to track and identify possible improvements in the consumption of energy. The system as it is allows:

- A rigorous monitoring (on real time) of energy consumption in several buildings;
- The optimization of energy consumption, avoiding loss of productivity;
- Corrective measures for the detected excessive and unnecessary consumptions;
- Waste reduction and decrease of CO2 emissions.

The public tender requirements require innovative solutions to be integrated and implemented.

CASE 4: ÁGUEDA PUBLIC LIGHTING [PT]

Águeda municipality has been the driving force to create a cluster of 15 SMEs developing, engineering and manufacturing advanced low consumption public LED lighting.

The methodology to attract these SMEs to an innovative culture has been based on the principles of public procurement of innovation by providing pilot cases (streets, public spaces) to implement new solutions requiring technologies that were a driver for the SMEs to establish links to the University and the Technological Institute. Different projects allowed to access best practices and technologies providing on one hand the municipality with the best value-for-money on an advanced solution and on the other hand creating an innovative environment where the stakeholders of RD&I could co-create and exploit new business opportunities.

This case has been driven and is being driven as a policy driver by the mayor of Águeda himself. He has been an enthusiastic adopter and promoter of the Living Lab methodologies and is using the public commercial procurement to successfully support this policy. As an additional benefit, the cluster of SMEs became a Living Lab (Lighting Living Lab) and the municipality itself is also a Living Lab on the way to become a smart city.

Many of the smart services that define a smart city are being implemented using the same methodology that was initially used for energy efficiency.

CASE 5: SMARTEST BUILDING WITH INTEGRAL SUSTAINABILITY [NL]

The Netherlands Institute for Ecology (NIOO-KNAW), which specialises in ecological studies at sea, on land and in fresh water, wanted its new building to be the smartest in the Netherlands. NIOO was committed to an integral approach to sustainability: only sustainable materials would be used; fixtures and fittings would be based on cradle-to-cradle principles; and a traditional heat and cold storage system would be used to generate energy, combined with an extra high temperature source (45°C), fed by solar panels and residual heat from industrial processes. A new – extremely deep and efficient – form of heat storage in the ground will be implemented, thanks in part to the province of Gelderland. Moreover, the plans include the establishment of as many recycling streams as possible on the site, by recovering important nutrients and energy from the solid organic waste and the purification of the waste water produced inside the building. The implementation of green roofing promotes local biodiversity and also improves air quality and solar exposure, leading to lower heating and cooling needs.

In principle, all the elements for such a sustainable building are available on the market; the challenge is largely to find and implement smart new combinations. Another hurdle was to determine how the ambitions for sustainability could be realised in accordance with European tendering rules. How do you hire companies that are willing to set aside the traditional way of doing things in the construction sector? The answer is that you conduct the tendering procedure based on EMAT criteria (EMAT = Economically Most Advantageous Tender) and create the freedom to propose innovative and sustainable ideas. Another new aspect was a start-up meeting in which all participating companies could familiarise themselves with the sustainability ambitions.

The brainstorming for this new-build project began in 2003. It took until June 2008 before the tender process (European procedure) began. The contract was awarded in February 2009. The building permit was obtained at the end of April 2009, and the first pile was driven into the ground a month later. The project is due to be completed by July 2010, when two of the three NIOO research centres will move into their new home in this super-sustainable building.

CASE 6: NEW APPLICATIONS FOR GREEN RAW MATERIALS [NL]

In 2008, a request for new applications for green raw materials resulted in twenty practical suggestions. This project is about using parts of plants (biomass) for products and services that are not related to food or biofuels. The Ministry of Agriculture, Nature and Food Quality intends to use this work to expedite the transition to a 'green' economy that is based primarily on the processing of plants. A bio-refinery is a good example: plant parts are separated into fractions that can be used for purposes other than food.

The twenty proposals each received a financial contribution for a feasibility study from the 'Small Business Innovation Research' (SBIR) programme. At the end of 2009 they will compete for a subsidy to develop a market-ready version of the proposal. Half of the total budget of €3.6 million is reserved for five of these proposals. Each development process has to be completed in 2011.

SBIR is a tendering process where the national government supports entrepreneurs in their research and development work. SBIR consists of three phases. In the first phase, the programme enables the entrepreneurs to conduct a feasibility study for the selected idea. In the second phase, the ideas that are the most innovative and have the greatest potential for success are funded for further development to create a workable prototype. In the third phase, the entrepreneur must launch the product or service on the market. SBIR is therefore a 'pre-commercial' tendering system.

CASE 7: SAVING ENERGY WITH WASTE WATER [NL]

The new NEREDA purification process has already won numerous prizes. Nevertheless, it took fifteen years for NEREDA to evolve from a technical invention to a ready-to-use system. Thanks in part to the commitment of several district water boards, the first installation for purifying domestic waste water will be operational in 2010.

This new technology is based on an idea that was developed at Delft University of Technology in the mid-1990s. While it normally takes a long time for bacteria to cause contaminants in waste water to settle as deposits, the process is completed in next to no time at all with NEREDA. As a result, a separate settlement tank is no longer necessary, thus saving both space and energy.

Engineering firm DHV was the first to see the value of this innovation. The technology has been in use in the industrial sector since 2004, but the system has potential for much wider application, such as in developing countries. For this next step, a client was needed that was willing to bear the risk of being the first to implement this new method. That client was the Epe waste water treatment facility, where a pilot took place in 2006 and where the first complete installation will begin operating next year. This achievement has been made possible thanks especially to the involvement of the following district water boards: Hollandse Delta, Rijn en IJssel, Veluwe, Waterschapsbedrijf Limburg and Hoogheemraadschap van Rijnland.

CASE 8: USE OF HYDROGEN AND FUEL CELLS IN THE CIVIL ENGINEERING SECTOR [NL]

RWS (the Directorate-General for Public Works and Water Management) asked the private sector to develop proposals for the replacement of diesel generators that are used to power mobile variable-message signs (VMS). Mobile VMS signs are used to warn drivers about diversions and accidents. The request for new, quiet, clean and sustainable generators resulted in fifteen respondents at the end of 2006. Of these, a jury selected six proposals for a feasibility study. In

November 2007 the field was narrowed to three respondents who were contracted to develop prototypes.

The three prototypes each employ the latest technologies as regards fuel cells, reformers, power extenders and control systems, but each in a different way. The construction of the three prototypes is due to be complete by the end of 2009. Then the makers are free to market their inventions, without having to pay RWS for a licence.

The request for replacement of the generators was put out to tender in accordance with the Small Business Innovation Research (SBIR) system. SBIR is a tendering process where the national government supports entrepreneurs in their research and development work. An SBIR project has three phases. In the first phase, the programme enables entrepreneurs to conduct a feasibility study for the selected idea. In the second phase, the ideas that are the most innovative and have the greatest potential for success are funded for further development to produce a workable prototype. In the third phase, the entrepreneur must launch the product or service on the market. SBIR is therefore a 'pre-commercial' tendering system.

CASE 9: SUSTAINABLE EMBASSY IN AMMAN [NL]

Innovation-oriented tendering abroad is much more complex than in the Netherlands. Each country has its own systems and culture where tendering is concerned, in which open contracts are by no means always a good solution. The Dutch Ministry of Foreign Affairs has a great deal of expertise when it comes to specifying contracts for building accommodation, and this enables the ministry to obtain the desired innovation from advisors through the tendering process. During the conversion of an existing villa into a chancellery in Amman (Jordan), for example, it succeeded in achieving innovative and sustainable solutions, in part by employing a visionary designer.

Dutch architect Rudy Uytenhaak signed on for the conversion of the villa into a chancellery. In his design he links new innovations with traditional solutions, such as in the building's heating and cooling system. Uytenhaak transformed a necessary structural reinforcement into a 'climate veil' by using tent cloth to allow the wind to blow through while still providing shade from the sun. Between the existing villa and a new upper floor he designed an extra space that captures the cool night air of the desert wind. During the day, this air is used to cool the work areas. He also transformed the existing swimming pool so that it now acts as a thermal buffer. With the incorporation of solar panels into the building design, the computers are actually powered by the sun.

In combination with numerous other ingenious elements, a building has been created that is one of the most sustainable in all of Jordan, as is shown by the fact that the embassy building is the first office in Jordan to receive LEED certification. The ambition is to attain the gold classification. Handover is scheduled for November 2009.

CASE 10: N50 BETWEEN RAMSPOL AND ENS [NL]

The conversion of a portion of the N50 between Ramspol and Ens into a motorway (2x2 separate carriageways) is part of the rapid resolution plan for 30 bottlenecks on national trunk roads. This project is a bold step to resolve the traffic flow and safety problems on this route. One element of the plan is the replacement of the Ramspol Bridge over the Ramsdiep, which is a busy inland navigation route. The bridge is outdated, has technical deficiencies and is not rated for the amount

of traffic it currently bears. The new bridge must be wider, higher, safer and –in particular– energy-neutral against the background of the intention of RWS to be a leader in sustainable procurement by 2012.

To encourage contractors to take an innovative approach to fulfilling these requirements, RWS commissioned a reference design. This reference design shows that the task of producing an economical design with power generation via solar panels and storage of solar energy in new generation capacitors.

The tendering process began in July 2009. The awarding of the entire contract is expected by the end of 2009. The award criteria emphasize quality, which is weighted at 70%, as opposed to 30% for the price. To keep the proposed costs within reason, however, RWS has established an upper limit for the bids.

The quality of the tenders will be assessed based on the degree to which the applicants (experts) are capable of identifying project risks and opportunities and converting them into added value for the project. In this case 'added value' means making a contribution to the project objectives, such as completion of the project within the agreed milestones and producing an energy-neutral, moveable bridge with a high level of operational reliability. Following a written assessment, the proposed added value will also be tested in interviews with key representatives of the tendering parties. This will also be taken into consideration in the award process.

CASE 11: REVOLUTIONARY CLIMATE CONTROL USING DEW POINT COOLING [NL]

The Ministry of Justice received a financial contribution from the State Buildings Department's Programme for Green Technologies (PGT) for the installation of indirect diabatic dew point cooling. This new cooling system operates based on the principle of warm air being cooled by directing it over water and causing evaporation to occur. In contrast to conventional cooling systems (air conditioning), this system does not use chemical refrigerants. Instead, the system uses fresh outdoor air; it also requires virtually no maintenance. As a result, power consumption is around 75% lower than normal. Furthermore, there is no need to keep windows and doors closed.

The new cooling system has been in use since the end of 2008 in the sports hall and observation areas of Noordsingel Prison in Rotterdam. The system has already proven to be such a success that the Department of Correctional Institutions has given the State Buildings Department the go-ahead to implement it in De Schie Prison in Rotterdam this year as well. The City of Rotterdam is now considering installing this innovative and sustainable system in municipal buildings.

The contribution from the PGT enabled the Ministry of Justice to be the first to implement this new technology, which led to a breakthrough for this form of air conditioning in the non-residential construction sector. The Green Technologies Programme is financed via the 'Clean and Efficient' programme of the Ministry of Housing, Spatial Planning and the Environment. This funding provides the State Buildings Department with €20 million over five years to help 'non-proven technologies' to achieve a breakthrough. The State Buildings Department advises and facilitates the user in order to quickly achieve the objectives of the 2020 energy programme – on average at least 2% energy savings per year and 25% on national government buildings.

CASE 12: STREET LIGHTS ON THE WATERLINIEWEG [NL]

The street lights on the Waterlinieweg were very outdated, and particularly the catenary lights along the central reservation could no longer be maintained in proper, safe working order.

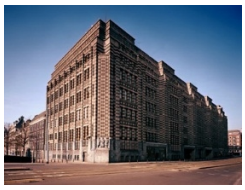
Furthermore, parts were no longer available for repairs, and the quality of the lights was mediocre while energy consumption and bulb replacement costs were high. As is often the case, the maintenance budgets were insufficient to cover replacement of the entire system. There have also been plans circulating for years that would involve changes to the Waterlinieweg – yet another reason why replacement of the street lights was continually postponed. However, in 2008 the point was reached when replacement could no longer be delayed. IBU Stadsingenieurs conducted a study to determine the options for saving money while still carrying out the replacement of the lights. A light intensity calculation was made for an alternative in which new, modern, dimmable fixtures would be mounted on the existing masts. The calculations showed that the desired light quality could be obtained if the masts were extended. All the masts were measured – virtually no two were the same – and an extended arm was developed. It was also necessary to remove the corrosion from all the masts and recoat them, and the base plates had to be refastened. In addition, a completely corroded power supply cabinet had to be replaced and a power cable had to be re-laid in a stainless steel conduit.

In 2009, *Stedelijk Beheer* (the city's public works department) obtained the necessary funding and the work began. First of all, the necessary preparatory work was carried out in collaboration with *Bureau Bereikbaarheid* (the agency responsible for maintaining accessibility in the city) and coordination with the scheduled major repair work to be done by the local road maintenance crew was ensured. The work to replace the street lights could then be carried out in various stages. One risk during the project was the strength of the masts themselves because the strength of the masts could only be measured once the old catenary lights had been removed. At that point there was no turning back, and the plan depended on reusing the existing masts. One mast was so badly corroded that the inspection company was unable to guarantee it would last more than a year. It has now been agreed that this one mast will have to be inspected annually.

The catenary lights have been removed, sixty-two 1x250 W high-pressure sodium twin-tube bulbs (extra-long service life of at least 24,000 hours with a maximum 5% failure rate) dimmed to 50% were mounted on extended 12 m masts, and a new power supply cabinet was installed. The result is a reduction in power consumption of 18,295 kWh per year.

All of the work was finished on schedule. The municipality gave the old fixtures to RWS Zuid Holland for replacements along the many kilometres of catenary lights that RWS Zuid Holland still maintains. Utrecht now has no catenary lights left.

CASE 13: Amsterdam City Archive: De Bazel [NL]



This case study describes the procurement and implementation of energy efficiency measures in the city archive, a historical building in the inner city.

Background

De Bazel is the city archive of Amsterdam and an impressive art deco building with a rich and royal history. The building, named after its architect K.P.C. de Bazel (1869-1923), was built between 1919 en 1926 for the 'Nederlandsche Handel Maatschappij' (Dutch Trading Company). De Bazel intended his architectural designs to be in harmony with their environment. His intention was to communicate a divine message through his creations. The rooms in the building were built in many styles. The more important you were, the darker the wood in the room was and the darker the colour green on the walls were. The hierarchical idea of the building was important too. Currently De Bazel is the city archive of Amsterdam and a conference centre. The large "King's chamber", as well as the six smaller adjacent rooms, have been restored to their original state. The banquet rooms with the lovely floors, ceilings with chandeliers, paintings, unique stained glass windows and chairs and tables designed by the architect himself, you feel as if you are back in the rich seventeenth century of the old Dutch traders. What is interesting is that De Bazel did not only design the furniture, but also ashtrays, pencils and a crockery set.

When in 2004 the decision was taken that the City Archives would move to De Bazel, one of the starting points was that the building, after renovation, needed to be as sustainable as possible. This meant that in the procurement process for Architects and construction companies a proper specification needed to be formulated and taken up into the procurement process.

The timeline for this proposal was:

- May 2004 – City Council decides on the planning
- August 2004 – Start procedure for monument-renovation
- September 2004 – Selection of companies by a European procurement process
- December 2004 – Start (Main contractor Jurriens BV started with the physical renovation of De Bazel)
- May 2006 – Opening

Building Specifications	
Length	102m
Depth	32m
Height	34m
Below ground	7m
Levels	11
Ground area	28.391m²
Usable area	19.461m²
Volume	105.615m³

Before the European procedures, it was decided that the Archive needed to be as sustainable as possible, both from a Heating and Cooling perspective (normally Gas-based) and from an electricity consumption and user perspective.

For both targets, ”innovation” was a key word, and since one department of the City of Amsterdam owned the building and the other department was renting it, it seemed possible to push innovation by making a broad business model.

Project Objectives and Benefits

- Lower the cost of Energy and create a business case for sustainable investment for Heating and the use of electricity in a historical building
- Get insight on the use of energy (being used for what)
- Find a model for partners to collaborate in making a building more energy efficient
- Design a replication model of the partnerships and investments being used.

Why is this project to be considered as pre-commercial procurement?

The City wanted to make a change in the way they were handling the maintenance of their buildings from a sustainability perspective, but had not totally clear what solution was envisioned. During the tender procedure as well as during the execution of the project, iteration was needed and the suppliers were asked to come up with suggestions on how to make the building as efficient as possible.

Phase	Innovative Aspects
Specification	Ask to suggest solutions to reduce the use of energy and made that a criteria, also on the finance part. So business cases were demanded
Contract	The contract was a joint development project
Order	-
Monitor	An energy monitoring programme was part of the contract and based on that the organization that is renting is charged for their real consumption
Support	-
Selection	-

Besides that the owner of the building made it possible for suppliers to come up with solutions where a business case was possible in 7-8 years instead of the normal 2-3 years. This gave the possibility to make business cases. Further on in this call we mention what suppliers were selected, but on the solution side there were solutions defined that would really make impact, both for the Heating and the Electricity challenges.

To reduce heating needs a high efficiency Heat Pump system was installed, with a geothermal auxiliary system that uses subterranean water to pre-heat the air. This was cost-effective due to the large heating requirements of the building because of high thermal inertia and spacious areas and room height.

The business case was made and the estimated Return on Investment is 7 years, based on a model which included an increase in the price of energy of 3% per year. It was also decided to install a sensor system for temperature monitoring and management. The sensors are providing input to a numerical model that was developed for the thermal characteristics of the building and taking into account meteorological data. Based on this the energy efficiency effect could be measured and projected for other buildings.

The second challenge was how to lower the use of energy being used by the users of the building, mostly electricity, as much as possible. During the process there was defined on what topics the building managers could have influence and where they did not. Nine areas were defined and taken into account:

1. The Building

The influence of the building manager on the existing system is low. This means that the building manager has to do with the building he manages. The manager does have influence on the choice of the installation at a (natural) replacement point.

2. Building Maintenance

The building manager can have a major impact on maintenance, such as in choosing the type of contract (maintenance party can be held partly responsible for the energy), or the number of contracts. A good maintenance management provides a financial benefit and energy savings.

3. Regulations

The influence of the building manager on the type of plan (think of the type and size of the control system) is low. The building manager can only insist on one type of plan for new construction or on a (natural) replacement point. Considering the settings of the energy scheme or under the variables under the control of the building manager, these sometimes are far too complex for an empirical approach, or the technicalities of the buildings complex solution may be too great for the lack the knowledge and / or time of the building manager to efficiently change the HVAC settings. In order to avoid unfavourable tampering of the HVAC systems, building managers should enable expert individuals or companies to optimize HVAC parameters.

4. Other

The item is other equipment. Depending on what equipment is being used in the building, the manager can great influence on its choice. The critical condition is that the procurement of IT equipment includes energy consumption criteria. It often happens that the IT automation does not include energy saving schemes. In many offices, the IT equipment represents a large part of the electric consumption (such as desktops, printers, copiers and most of all, servers and data centres). Energy efficiency best practices should be followed, taking into account options such as the outsourcing of data centre capacity and ICT energy management.

5. Users

The building manager has a moderate influence on the behaviour of users. The manager would indirectly influence the behaviour of the users by raising awareness of their energy consumption (real time information displays with energy consumption and costs data placed in visible common areas of buildings, for example). The influence of the manager on the behaviour of the user depends on how the building manager is involved with the users (is there contact with management or the users, for example).

Also, HVAC and lighting settings (both temperature and working periods) must be defined judiciously, in order not to lower the users' quality of life, which would hamper productivity and cause unrest towards the users.

6. Subcontractors

The building manager has much influence on the choice of subcontractors (once again the need to include energy and material efficiency contract criteria and procedures). These subcontractors have much impact on energy consumption, if they so wish (cleaning, janitorial and security personnel can have a key role in making sure that the building functions properly).

7. Consumables

Concerning procurement criteria for consumables, the building manager can have a decisive and challenging role, needing to choose products that are cost-efficient. This calls for the need to calculate a life-cycle analysis of the investment (for example, eco-lamps are more expensive, but last longer and/or consume less power than their normal counterparts).

Based on these key points, several best practices were identified. To assure that this efficiency mind set was sustainable; the building managers were trained in energy management and are obliged to include their analysis in all the contracts adjudicated and tenders performed. Also the installation of a smart sensor system provides for a comprehensive and detailed report on the buildings energy consumption.

The list of stakeholders mentioned above gave an insight in how more energy could be saved and a plan was developed to continuously improve the efficiency indicators along the action lines that were formulated. Every year a list of new solutions is defined and if a reasonable ROI is verified, they are implemented and monitored. Hereby De Bazel is functioning as Living Lab.

Project team

At the base of the team was Ronald van Warmerdam, senior advisor of the City of Amsterdam for Energy transition in relation to buildings. Ronald organized a team of experts and included industry knowledge and knowledge institutions to collaborate on this project (not only technicians, but also specialists in processes, monitoring and people with expertise in Public Private Partnerships).

Selected Suppliers

Several suppliers were selected, architects, construction companies, IT companies and energy specialists and they were asked to contribute in a consortium to this project and commit themselves to the results, also in a financial way.

Selected supplier 1: Waternet

The local company responsible for the water distribution had the ambition to broaden its scope and wanted to develop services around custom made solutions to use water for heating and cooling. Together with the city of Amsterdam Waternet was willing to sign a contract based on a 7-year return on investment. The construction was similar to a lease construction. To really get an

insight in the results, to make sure the same level of convenience was reached a sensor network was rolled out through the building and a model was made.

The goal of this model was to make a benchmark and to research the replicability of the chosen solution to other (large historical) buildings.

Conclusions

The case of De Bazel is interesting because it is based on several principles: New collaboration /business models, new technology, monitoring of results and impact.

- **Intention:** to procure a total solution to make an old historical building energy efficient
- **Partners:** City of Amsterdam, Claus and Kaan, Waternet, PM, Jurriens and others.
- **Objective:** to make a state of the art Energy-efficient building and find the proper way to do this, making sure impact, investment and benefits were all placed well.
- **Timing**: From 2004 to now (ongoing process)

The selection of the approved and innovative solutions and the procurement process is been very successful and is currently being copied to other building in the Amsterdam Area. Interesting is well that an on-going project is defined with a feedback loop to implement new solutions again and again.

Process case studies

CASE 1: SAVE ENERGY

1 – Objectives

The purpose of this project was to develop and implement energy efficient solutions in public buildings. The SAVE ENERGY Project (238882 – CIP– ICT-PSP – 2008) brought together several public and private entities in 5 different countries: Portugal, Sweden, Netherlands, United Kingdom and Finland.

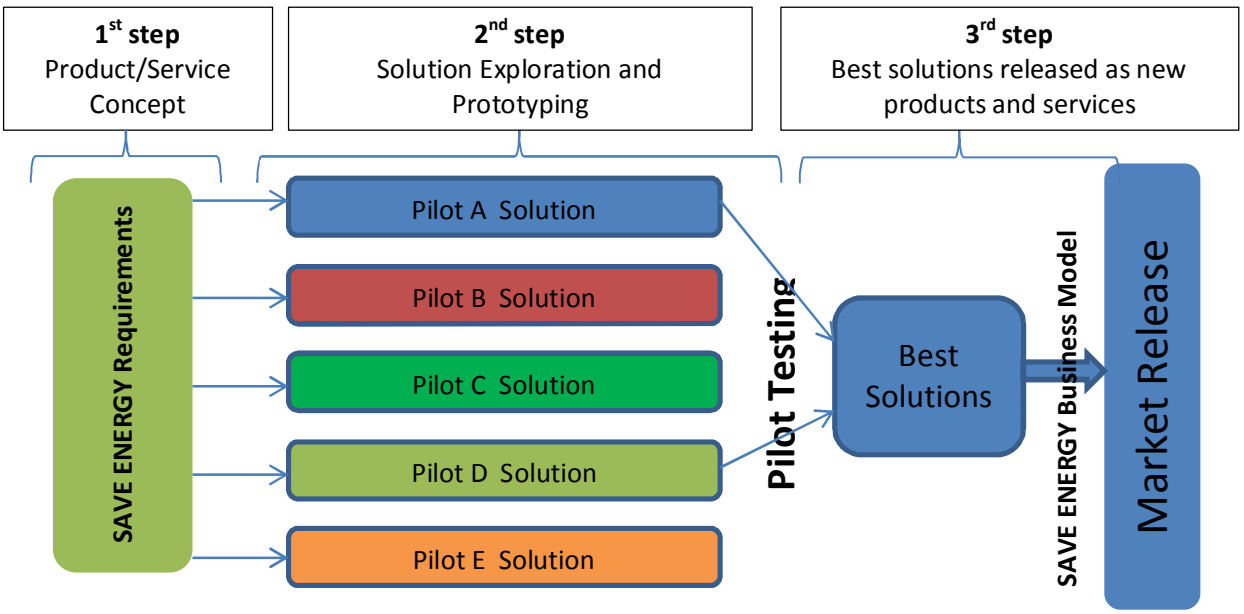
The general awareness of the excessive energy consumption in public buildings drove this project into testing energy efficiency solutions in several public buildings such as schools, an art gallery and service buildings. The most obvious way to increase energy efficiency is to develop and implement solutions in terms of energy management systems or replace current systems for more efficient ones. A less obvious way that is addressed by this project is the objective of achieving energy savings through behaviour transformation of the users, which is clearly an innovative approach to this issue.

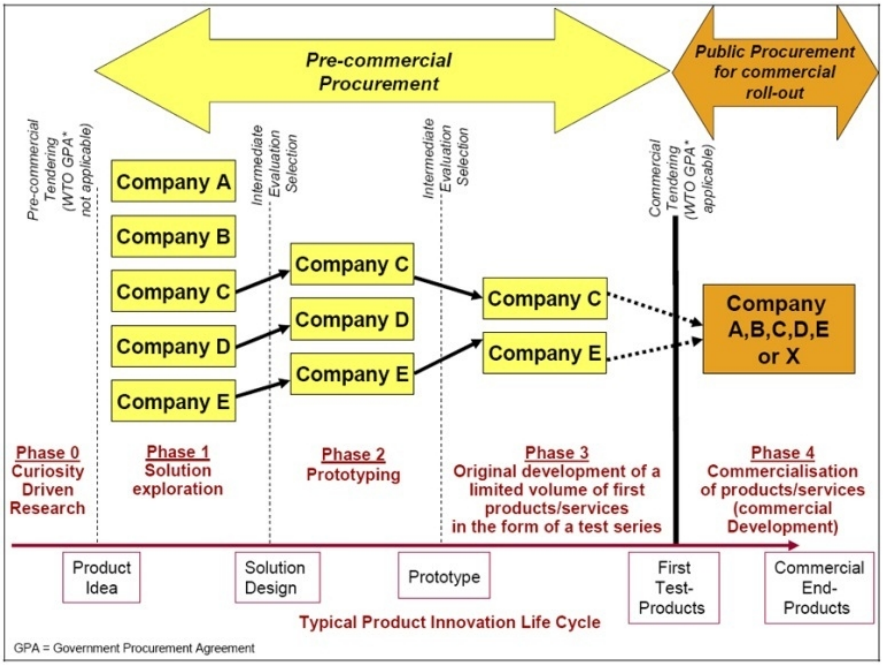
The intrinsic challenge was how to make the user to change their energy consuming behaviour when they are not directly involved in the payment of that energy. To address this challenge, real time energy consumption monitoring and public displays were implemented in the pilot buildings. This makes users more aware of their consumption behaviour and actions that can trigger energy savings.

This innovative system has been developed and implemented using the Living Lab methodology approach, which presents clear advantages. By involving the users from the beginning of the project in the creation and development of the systems, they become more aware of the problem being addressed. This has a clear positive impact on the motivation of the users and in the sustainability of such motivation, which is of high importance when trying to achieve behaviour transformation.

2 – Public Procurement Process

The following two figures demonstrate the parallel between classical PCP definition and the example of SAVE ENERGY, where the whole project can be considered the client.





The process leading to the procurement of such solutions is structured and can be summarized as follows:

1st Step – Public entities are becoming aware and committed to find energy efficiency solutions for public buildings. EU and National policies also encourage public authorities and establish goals in terms of energy efficiency and deadlines to achieve them. A consortium is established, involving public entities and private companies, with the aim of finding the best solutions to the challenge based on the Living Lab methodology (cross-border, regional exchange of experience).

The requirements and objectives are established by the consortium of the project: 20% savings in energy consumption due to increase in energy efficiency, metering capabilities of electricity, heat and environmental conditions and integration with an open-source middleware platform (iCenter) for collecting and analysing energy data.

2nd Step – Each pilot chooses one solution from a selection of technologies and contractors (local or international) – as in Phase 1 of the PCP diagram, some companies are discarded at this stage, as their products and/or solutions do not comply with specifications. A solution that follows the requirements defined in the 1st step is then implemented and tested in the pilot building.

3rd Step – After testing and evaluation of the five different solutions, only two were considered viable for project replication (ISA and KYAB's solutions). These SMEs have now a solution that is ready for market, and project exploitation disseminates the results to other public entities, leading to classical public procurement. This information establishes the basis for the public procurement framework in energy efficiency solutions to be implemented in other buildings across Europe.

3 – Results

The project has finished with reported savings of over 20%. Public entities are becoming aware of these results and the outcome of the project can be seen as a best practices Maual on how to further implement such energy efficiency solutions in public buildings, regardless of their nature. Public authorities will use the SAVE ENERGY Manual as a guideline for procurement in energy efficiency solutions.

Public authorities have expressed their interest to extend the implementation of these solutions being developed within the SAVE ENERGY project to other public buildings, for example, in Helsinki there is the public interest to extend these solutions to the other 170 schools in the city. In Manchester the project is being looked with special attention since the pilot involved is an ancient building and the interest of implementing energy efficiency solutions that can be applied to such buildings with low costs of implementation spread throughout the city and the country, is an objective of the public authorities.

CASE 2: MOBI.E

1 – Objectives

The Portuguese Government is pushing for the adoption of electric vehicles as a mean for citizens' mobility. This is included in a larger national strategy to address the energy efficiency policies, reduction of greenhouse gas emissions and tackle the climate change. Portugal is already taking the leading role in terms renewable energy production.

To make electrical mobility a sustainable reality in Portugal, a whole new economic sector is being promoted. Agreements with multi-national companies in the automobile industry were established, for example the agreement with Renault-Nissan for building a new factory for electric vehicles' batteries.

Another challenge in establishing the electric mobility as a viable alternative is to have a widespread public infrastructure for charging electric vehicles. For this purpose, the government has conducted several studies, involving private companies in order to develop a business model and strategy for the deployment of a public charging network infrastructure.

As a result, the Portuguese government took the initiative of creating a consortium comprising private and public companies under the project name Mobi.E, with the purpose of developing and deploying a pilot network of charging infrastructures for electric vehicles. This pilot network will be implemented in 25 Portuguese municipalities, chosen with the purpose of being a test-bed for the electric mobility in Portugal. A total number of 1300 normal and 50 fast charging points will be installed in public spaces during this pilot phase. These charging points were bought to tree different companies by means of a generic tender that allowed for innovative solutions and designs.

This pilot phase will run until the end of 2012 and will serve to test solutions on a technological and business model level, for defining standards for a nationwide network of charging points for the future, hence promoting the adoption of electric vehicles as a viable way of ensuring citizens' mobility.

It is believed that after 2012 the business model as well as the technological development is sufficiently mature to take off on its own, under public regulation.

2 – Public Procurement Process

The process can be summarized in the following steps:

1st Step – Decision made by the Portuguese Government to develop and public charging network for electric vehicles. From here, the Mobi.E consortium involving public and private companies was established with the aim of developing the systems and standards for the public network. The pilot phase involving 25 municipalities will run until the end of 2012. The 1350 charging points will gradually be installed, being the time schedule defined by the government.

2nd Step – During the pilot phase, several technological solutions are tested including normal and fast charging. Also during this phase, various service models are tested. The charging and communication protocols are public and any company can create a charging solution that can be integrated in the Mobi.E network if it complies with requirements, insuring that they can then sell their product to public and private entities. In the uncertainity of the uptake of electric vehicles by the general public, Government, Municipalities and private companies share the risks of implementing the pilot national charging network.

3rd Step – Being the service model and role's definitions mature, after 2012, the charging network is enlarged involving private stakeholders as service providers and other electricity companies as providers.

3 – Results

New advanced business models are developed, placing the electric vehicles' users as active players in the electricity market by having the ability to choose their electricity provider regardless of the location of the charging point (open electricity market) and having the ability to sell the accumulated electricity in the vehicles' batteries back to the grid (V2G). For this, new model and technological solutions will have to be procured. Speed up of the creation of market-ready slow and fast charge solutions.

CASE 3: FUEL CELL BUSES

1 – Objectives

The organizations involved in the project were the Hamburg State Ministry for Urban Development and the Environment, Energy Department and the City of Hamburg. The procurement project was preceded by an EU-funded project called CUTE (2009), which is a network devoted to the procurement of fuel cell buses.

The purpose of this project was to procure fuel cell buses to be used in the public transport system of Hamburg.

A general concern for environmental issues may be seen as the starting point for this procurement project. In combination with alternative energies, these buses are environmentally sound and a real alternative to fossil fuel buses. Introduction of this technology would render positive effects on the air quality of the inner city of Hamburg and also make the vision of a zero emission vehicle come true.

The process leading to the procurement of fuel cell buses was a structured process that can be summarized in next section.

2 – Public Procurement Process

1st Step – Decision by the Senate of Hamburg to establish the initiative "Fuel Cells and Hydrogen Technology Hamburg". This group was set up to enable collaboration and information change. Members of the group were companies, research organizations, universities and public authorities working with these issues.

2nd Step – Hamburg participated in the EU project CUTE (Clean Urban Transport for Europe) as mentioned above. The city-owned enterprise "Hamburger Hochbahn AG" procured 3 buses and tested them for every day usability.

3rd Step – Initiation of a global buyer network for fuel cell buses (including cities such as Barcelona, Amsterdam and Perth). This network aims to generate bundling of demand for fuel cell buses which will create an innovative market, and also foster a decrease of the purchase price.

Hamburg is not the only city that has purchased these buses. Other cities have implemented this technology in their public transport system as well (Amsterdam, Barcelona, London, Perth). All cities signed a memorandum of understanding in order to bundle market quotations and acquisitions [32].

3 – Results

Innovative solutions, cost reductions and an amelioration of negotiation position versus the supplier, which foster decreases of purchase price[3] and the Creation of a Network of fuel cell buses in Hamburg and Germany.

CASE 4: NEW LIGHTING SYSTEM IN HAMBURG

1 – Objectives

The City State of Hamburg procured a new lighting system for all its 1,500 public buildings at a cost of €19 million (Budget October 2005), to save energy, improve the working environment and reduce life cycle and maintenance costs.

The procurement was aligned with the State's political decision to strive for energy- and resource-efficiency in its activities, and specifically that every investment in energy-consuming equipment must be cost-effective in the long run; i.e. the life cycle cost should be the deciding factor. The aim of the procurement was to deploy a largely existent, yet relatively new technology, with supplier began compelled to conduct a certain amount of product development to meet the specification of requirements and also experimenting with more recent lighting technologies.

[32] BODEWES, H. et al., 2009. *Exploring Public Procurement as a Strategic Innovation Policy Mix Instrument*. Berlin.

2 – Public Procurement Process

Via a pilot experiment based on similar technology 10 years earlier, the procuring authority was well aware of the potential for energy-saving and was familiar with the potential suppliers. Because there was no need for consultation with users and the authority responsible had its own budget for the purpose, the authority itself organized the work of specifying requirements.

1st step - To ensure an innovative and cost-effective solution, the authority conducted informal discussions with all potential suppliers to inform them of the City/State's needs, and in particular to discuss various possibilities for cost reductions. For parts of this process, the authority engaged an external source of technical expertise, but supplier contacts were also facilitated by the knowledge, contacts and experience of the authority's own electricity supplier. These discussions were conducted six weeks before the start of the formal procurement, firstly to ensure that the volume and complexity of the procurement was manageable and secondly to clearly distinguish these discussions from the formal procurement process, so as thereby to reduce the risk of criticism for favouring any particular supplier.

During the preliminary discussions, the authority was completely open to all parties as regards problems and solutions, but maintained strict secrecy concerning price and any special characteristics of the products of individual suppliers. The procurement, which was conducted at EU level on the basis of the MEAT[33] criteria, was divided into several sections (including project design, logistics, lighting systems, recycling etc.) to reduce risk and cost. Because the purpose of the procurement was to deploy (rather than develop) new technology with predefined technological requirements for the system, cost was the most important factor. However, the cost was based on a life cycle calculation, taking into account the cost of purchase, installation, maintenance and energy consumption.

In every part of the procurement, several suppliers were selected to provide a spread of risk and benefit, and so many fairly small enterprises were engaged. This in turn led to demands for professional project management. The combination of global procurement for the lighting system allowed the process to benefit from the efficiency of the global market, while at the same time installation and maintenance were mainly performed by local service enterprises, stimulating the local business sector. However, the fact that installation and maintenance would be performed mainly by local service businesses (despite the fact that the procurement was conducted at EU level) was something that had been neither anticipated nor planned.

2nd Step - The project was criticized both by public opinion and the region's business community, because the initial costs were high (and electricity prices at the time were low) and because the contract for the electric lighting system did not go to a regional supplier. The first problem was resolved by a clear investment plan and the second disarmed through the dominance of local service enterprises in installation and maintenance.

The replacement of the lighting system and other public-sector activities to promote energy-and resource-efficiency has impacted on the private business sector in Hamburg. Many businesses have followed the City/State's example and invested in energy-and resource-efficiency

[33] Most Economically Advantageous Tender

improvements – partly persuaded by subsidies. Private enterprises are also being offered the chance of acquiring new lighting systems on the same terms as the City/State while at the same time the local electricity supplier has offered an investment credit, set off by installments on the customer's electricity bill.

3rd Step - The City then initiated an "environmental partnership" to further stimulate energy-and resource-efficiency. Enterprises contributing to efficiency of this kind qualify for an investment subsidy of €1,000– 50,000 and a substantial discount when investing in lighting systems similar to the one procured by the City. The cost of the system is nearly halved and a subsidy of €1 per light bulb is paid by the City. In addition, the City offers a free review of the energy-saving potential of enterprises participating in the environmental partnership.

3 – Results

Through these activities, a considerably larger market was created, enabling the suppliers to offer highly competitive prices and innovative solutions.

4 – Lessons Learnt

The value of clear political support for environmental and life cycle thinking;

The value of professional, centralized project management;

The value of internal expertise within the procuring authority;

The value of regular industry contacts before and during preparation of the specification of requirements;

The value of being able to make use of the knowledge, contacts and experience of a major local enterprise (the city's electricity supplier);

Horizontal coordination of needs creates critical mass and benefits of scale;

Splitting of a complex and large-scale procurement into several smaller sections (with clearly defined interfaces between suppliers) reduces the risks to both authority and suppliers;

It is possible both to benefit from the efficiency of the global market and to favour the local service sector;

An authority may via targeted initiatives develop and consolidate a market to the benefit of private enterprises, while at the same time favoring energy-and resource-efficiency in the business sector[34, 35]

[34] VINNOVA - Verket för Innovationssystem/Swedish Governmental Agency for Innovation Systems, 2007. Public Procurement as a Driver for Innovation and Change. Vinnova Policy VP 2007:03. VINNOVA.

[35] Cordis.europa, 2006. CASE 1: New lighting Systems: Modern Technologies for Energy Efficiency. [Online] Available at: ftp://ftp.cordis.europa.eu/pub/innovation-policy/studies/case1.pdf [Accessed January 2011].

CASE 5: SOLAR ENERGY IN SUPPLY MARKET LISBON REGION, S.A – MARL

MARL energia

1 – Objectives

The objective of this project was the construction of a photovoltaic plant on the roof of 11 buildings of the Lisbon Region Supply Market, S.A.(MARL). The investment was €30 million and involved MARL and private companies. In January 2009, the "Marl Energia" started the construction and operations began on November 25, 2009.

This infrastructure is the largest urban photovoltaic plant of the world, with 6MW of installed power, enough to supply electricity to more than 3000 homes, or 12000 people. The project will push for a more efficient use of renewable energy, the development of innovative photovoltaic technology in Portugal, thus increasing the quality of life and decreasing CO2 emissions.

2 – Process

1st Step – In 2006, MARL administration decided to launch the first tender, with nine projects and five companies, presenting their conceptual that proposals using innovative technologies and systems;

2nd Step – In November 2007, three proposals were chosen for the second stage: EARTHLIFE, and the consortia DALKIA/EDIFER/FDO/RR and FOMENTINVEST/CAIXA CAPITAL/GLOBAL SOLAR FUND this was based on the best solution taking in consideration technologies and prices;

3rd Step – The winning proposal was one made by the consortium Fomentinvest, SGPS (that also incorporates Caixa Capital, a New Energy Fund and Efacec).

3 – Results

The photovoltaic panels supplier choice was in strict compliance with international requirements IEC, TUV e VDE and manufacturing experience, this ensuring high levels of performance. The company selected was the Atersa.

In January 2009, the "Marl Energia" started the construction and operations began on November 25, 2009.

Because of space and weight limitations on the roof of the eleven MARL buildings, the companies have implemented best practices and innovative solutions.

CASE 6: ENERGY EFFICIENCY PROGRAM IN PUBLIC ADMINISTRATION, ECO.AP

1 – Objectives

This program was approved by the Portuguese Ministers Council (RCM 2/2011). The Ministry of Economy, Innovation and Development (MEID), through the executive direction of the National Action Plan for Energy Efficiency (PNAEE), defined the coordination and monitoring of ECO.AP, promoting the coordination and training of local of energy managers, referred to in 1st step of the public procurement process below.

The program ECO.AP will allow savings up to €50 million per year and decrease the emission of one million tons of CO2.

The following objectives were addressed:

I. Reduce the energy consumption in buildings and public facilities, particularly through the procurement of energy service companies (ESCOs). By 2020, the objective is to increase 20% the level of energy efficiency in service and public administration offices;
II. Reduce greenhouse gas emissions;
III. Stimulate the economy through the creation of laws for ESCOs and public procurement of energy services management;
IV. Contribute to the execution of the objectives determined in Climate Change National Program (PNAC) and National Action Plan on Energy Efficiency (PNAEE).

The Achievement of these objectives will lead to the development of new business models and new innovative Products and energy efficiency solutions.

1st Step:

I. Until April 2011, all departments and offices of State´s administration, public companies, universities, public foundations, public or private associations, with public capital majority shall nominate a local energy manager, responsible for activating and deploy measures to increase energy efficiency.
II. Until April 2011, a market system of “white certificates” will be implemented, including in the public administration, developed by the Directorate-General for Energy and Geology (DGEG) involving relevant entities.
III. Promote a program to increase energy efficiency in public lighting in line with the support system of the National Strategic Reference Framework (QREN).

2nd Step:

I. Until the end of the June 2011, implement a barometer of energy efficiency with the aim of making public the energy consumption of all public buildings and public services. This development will be performed by the Energy Agency— ADENE.

II. Determine that each Ministry should select, until the end of June 2011, entities in their dependence which together represent at least 20% of energy consumption and that whom, individually or grouped, have a consumption higher or equivalent to 100 MWh/year, in order to perform a procurement concourse for energy efficiency management;

3rd Step – All Ministries should implement, by the end of 2013, energy efficiency measures in all entities in their dependence, through energy efficiency management contracts, where this procedure is suitable.