

# **PRE-COMMERCIAL PROCUREMENT OF INNOVATION**

**A MISSING LINK IN THE EUROPEAN INNOVATION CYCLE**

**MARCH 2006**

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# TABLE OF CONTENTS

<b>TABLE OF CONTENTS</b>	<b>2</b>
<b>BACKGROUND</b>	<b>3</b>
<b>EXECUTIVE SUMMARY</b>	<b>4</b>
<b>1. RATIONALE FOR PRE-COMMERCIAL PROCUREMENT OF INNOVATION</b>	<b>5</b>
<b>2. SETTING THE SCENE</b>	<b>7</b>
2.1. The Market Forces: Trade Giants on the Watch	7
2.1.1. WTO rules and international practices	7
2.1.2. Strategic use of Innovative and R&D procurements in the US, Asia and EU	8
2.2. State of play in the Member States	11
2.3. The Institutional Forces - A legal framework on the move	13
2.3.1. The new Public Procurement Directives – Innovative Procurement	13
2.3.2. The new State Aid Framework for R&D and Innovation – Promoting Risk Taking and Technological Experimentation	15
<b>3. PRE-COMMERCIAL PROCUREMENT OF INNOVATION</b>	<b>16</b>
3.1. What is Pre-commercial Procurement of Innovation?	16
3.2. Why are Innovative Procurement and State Aid Instruments alone not enough?	17
3.3. How to approach Pre-commercial Procurement of Innovation	18
3.3.1. The legal basis for a 'European' Programme	18
3.3.2. Positioning in an end-to-end procurement process geared towards innovation	20
3.3.3. A shared risk – shared benefit approach	23
3.3.4. The participants	26
<b>4. CANDIDATE AREAS OF PUBLIC INTEREST</b>	<b>27</b>
<b>5. INCENTIVES</b>	<b>29</b>
<b>ANNEX I: PARTICIPANT LIST</b>	<b>30</b>
<b>ANNEX II: CANDIDATE AREAS OF PUBLIC INTEREST (DETAIL)</b>	<b>31</b>

## Background

At the last National IST Research Directors Forum<sup>1</sup> meeting in October 2005, a Working Group was set up with the mission of preparing a discussion paper on Public Procurement in support of Research and Innovation in ICT (Information and Communication Technologies) to be debated at the ICT RTD '06 High Level Event<sup>2</sup> organised on 22-23 March 2006 in Vienna under the Austrian Presidency.

The Working Group has been supported by the Commission JRC IPTS Services<sup>3</sup>, which carried out interviews with representatives from Member States to collect an overview of the current situation in the EU-25 with regard to public procurement practices in support of ICT Research and Innovation, in comparison with case studies from other parts of the world.

The Working Group has met a couple of times, extended with external participants from national government/procurement organisations, industry associations and legal experts. The participants list can be found in Annex I.

This report summarises the major findings and recommendations of the above National IST Research Directors Forum Working Group on Public Procurement in support of ICT Research and Innovation.

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<sup>1</sup> The National IST Research Directors Forum (NAT IST RTD Directors Forum) brings together National IST (Information Society Technologies) Research Directors to discuss key policy and implementation issues related to the development of a European Research Area in IST. The forum complements the bottom-up approaches supported by the Framework Programme. <http://www.cordis.lu/ist/about/era.htm>

<sup>2</sup> ICT RTD '06 High Level Event, [http://www.bmvit.gv.at/en/eu\\_rat/innovation/events/ict2010.html](http://www.bmvit.gv.at/en/eu_rat/innovation/events/ict2010.html)

<sup>3</sup> IPTS (Institute for Prospective Technological Studies), based in Seville, Spain is one of 7 research institutes that make up the Joint Research Centre (JRC) of the European Commission.

## **Executive Summary**

This report shows how a first-buyer function can be built up in a European single market that aims at being competitive, fair and transparent. The report introduces the concept of **Pre-commercial Procurement of Innovation**, to address a generally missing link in the European innovation cycle, the public procurer that is prepared to share benefits and risks with industry in order to exploit the results of research, moving research developments from their early stages to tested pre-commercial products ready for commercialisation.

Such **first buyers** play an important role in the US economy as well as in the major Asian economies. For their product development, many European companies have historically benefited from first-buyer partnerships with state monopolies. Those partnerships are now successively dissolved as the markets, rightly so, are deregulated.

The report explains how Pre-commercial Procurement of Innovation can be organised within the WTO rules applying the new public procurement directives and the state aid rules recently under consultation. Legally it is a procurement of R&D services that falls under an exception of the directive. The fundamental Treaty principles of non-discrimination, transparency and objectivity are however applicable and thus the procurers have to accept **European-wide offers**. The tenders have to be published in an adequate way, an obligation which indicates that the exploitation of EC supported research demands European-wide publication.

The proposed Pre-commercial Procurement of Innovation process is based on a shared risk – shared benefit approach and demands an **incentive** for procurers who normally are expected to adopt a purely commercial practice. This report proposes that the Commission considers using the CIP or other relevant instruments to create such an incentive.

There is nothing preventing Member States from introducing their own pre-commercial procurement schemes as long as they fall within the legal constraints identified by the working group. It is however desirable that the schemes are coherent and transparent. Therefore the working group proposes that the Commission provides **guidance** on “best practice” related to Pre-commercial Procurement of Innovation.

In the report one possible approach is discussed. The approach is similar to US and Asian schemes but adapted to the European context. Pre-commercial Procurement of Innovation is proposed to take the form of **a single public procurement in three steps**. The first step is a solution exploration phase, followed by a prototyping phase and finally a test series. In the first phase some 6 to 7 offers could be selected, the number of suppliers being reduced after each step subsequent to evaluations. In the final step at least two contractors should remain to ensure a future competitive market.

A **European dimension** would build critical mass on the demand side, stimulate competition and exploit economies of scale and scope. It would contribute to solving pressing European issues such as interoperability and coherence of solutions across borders. It would stimulate the uptake of European research and trigger organic innovativeness among suppliers. Finally, cooperation on European level would reduce the risks for the individual procurers of purchasing yet-to-be proven technologies.

The working group therefore proposes the Commission to **organise workshops with relevant procurers** in a limited number of areas to explore their interest in joint actions. The Committee of Regions has expressed an interest in co-organising workshops with procurers of ICT tools for Transport, eHealth and eGovernment. The report proposes that DG INFSO cooperates with other DGs concerned to organise workshops in other relevant areas such as Security and Railways. It is finally recommended to explore the possibility to expand the planned article 169 initiative on eInclusion to pre-commercial procurement.

# **1. Rationale for Pre-commercial Procurement of Innovation**

Increasing **European competitiveness** in the global marketplace is a top priority of the Lisbon Agenda for the EU and Member States. The Lisbon agenda highlights the need for actions on a wide scale. For example, there is a need to develop the market for risk capital, to increase the availability of seed money and funding of expansion. There is also still a lot to be done to strengthen the Single Market, to implement deregulations and to introduce competitive practices such as the new directives for public procurement.

Instrumental in achieving the objective of the Lisbon Agenda is to enhance **European Innovation**, the capacity to valorise new R&D results into marketable products and services. Recognising that efforts need to go beyond increasing R&D investments up to levels comparable with US & Japan<sup>4</sup>, the renewed Commission action plan on the Lisbon Partnership for Growth and Jobs<sup>5</sup> has called for **an integrated approach to research and innovation**. As a concrete measure to improve the conditions for commercialisation and exploitation of the research results, the action plan underlines explicitly the huge potential of **using public procurement to encourage innovation by providing a 'lead market' for new technologies**<sup>6</sup>.

The Aho Group, set-up after Hampton Court, underlined in their Report<sup>7</sup> the urgency to develop an **explicit strategy at European level** to use public procurement to drive demand for innovative goods and services: *"while at the same time improving the quality of public services and the productivity of Europe's large public service sector. The role of the public sector purchaser as intelligent customer should be fostered, for example as a part of the large-scale strategic actions we propose. Actions to mobilise procurement are needed to coordinate or aggregate demand to create sufficiently large orders that make innovation worthwhile."*

Europe has a strong tradition to build on. Historically, many innovations in leading European companies originated from public-private partnerships between old state monopolies - e.g. in telecom, railways and energy – and private suppliers. Some of these partnerships still exist. However, as the markets are becoming more and more deregulated, and rightly so, those partnerships are being dissolved. Thereby, Europe is starting to lose an important link in the innovation cycle: a **technologically demanding first buyer** who is prepared to share the risk and effort to move R&D into commercial products and services. In this report we are highlighting this question.

Public authorities and utility companies still face the need – and even the obligation with regards to tax payers - to provide citizens with services of **public interest of the best possible quality**. As public goods and services often face a situation of market failure<sup>8</sup> in the sense that the natural market incentive for suppliers to invest in research and innovation for private sector customers is higher than for public sector customers, public authorities are entitled to consciously drive innovation from the demand side in those markets. It is from this mindset that this report addresses public procurement.

To address this problem we need to implement **Pre-commercial Procurement of Innovation** in Europe. Pre-commercial public procurement schemes in other parts of the world such as the US and some Asian countries have proven their ability to provide the missing link between private sector R&D investment and the public sector as 'first buyer' of new technologies. This invaluable experience in refining the first-buyer strategy reveals that the pay-off in terms of creating truly sizeable lead markets

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<sup>4</sup> *The January 2006 Innovation Scoreboard (IP/06/21)* confirms that the gap with US, Japan and newly emerging world class R&I centres China and India will not close if EU-25 simply continue along their current R&I trends.  
[http://trendchart.cordis.lu/tc\\_policy\\_information\\_fiche.cfm?id=3197](http://trendchart.cordis.lu/tc_policy_information_fiche.cfm?id=3197)

<sup>5</sup> [MEMO/05/366](#)

<sup>6</sup> Website of the *Lisbon partnership for growth and jobs: 'Time to Move up a gear'*:  
[http://europa.eu.int/growthandjobs/areas/fiche06\\_en.htm](http://europa.eu.int/growthandjobs/areas/fiche06_en.htm)

<sup>7</sup> *'Creating an innovative Europe: Report of the independent expert group on R&D and innovation appointed following the Hampton Court Summit'*, Aho Group, January 2006

<sup>8</sup> See page 8 on definition of market failures (e.g. for public goods/services): "State Aid Action Plan: Less and Better Targeted State Aid: A Roadmap for State Aid Reform 2005-2009"

for new technologies is only going to be significant when applied in Europe if our pre-commercial procurement strategy respects two fundamental principles<sup>9</sup>: (1) willingness of public procurers to **share risks and benefits** of high-tech R&D procurements with future suppliers, (2) **bundling of demand** to reduce market fragmentation and narrow the R&D public procurement investment gap between the EU and the US. We also need **incentives** to overcome risk aversion of public procurers. These issues will be analysed in further detail in this report.

Why do we need a **European dimension** to public procurement in support of research and innovation? First of all because a number of services of public interest today (e.g. transport: railway signalling and toll collection systems) are implemented without a concerted European vision, which leads to fragmentation of the European market and a lack of interoperability and coherence of solutions across borders. If we want to stimulate the take-up of European research and trigger an organic wave of innovativeness amongst suppliers, building critical mass on the demand side to stimulate competition and exploit economies of scale and scope is indispensable. Last but not least, pooling resources and experience from a number of public authorities enables to reduce the risks of purchasing yet-to-be-proven technologies to a risk level which is acceptable to share by all parties, a hurdle apparently too big to take for any Member State on its own. A Shared Risk – Shared Benefit approach for pre-commercial technology procurement is the key to success here. And, perhaps as important, the European dimension strengthens the development of a truly single market.

The large-scale strategic actions for which the Aho Report Group requests an explicit strategy at European level are: **eHealth, Pharmaceuticals, Energy, Environment, Transport and Logistics, Security, and Digital Content**. It is not a coincidence that for all of these areas public sector demand is extremely important *and* ICT plays a key role as a catalyst of innovation. An independent expert study on public procurement commissioned by DG ENTR<sup>10</sup>, as well as a Commission IPTS Member State Survey<sup>11</sup> identified the ICT sector to generate a substantially larger number of innovative procurement success stories around Europe in comparison with other sectors. The ISTAG report on "Visions for Europe"<sup>12</sup> confirms the **pivotal role of ICT as a constitutive technology in shaping and transforming innovation processes across other sectors**. Together with renowned experts on innovative procurement<sup>13</sup> the Aho Report suggests that Europe should develop **sectoral policies for public procurement in support of Research and Innovation**. This report will therefore look at public procurement through 'ICT glasses' and identify key ICT application areas of common European interest where public sector demand for new ICT technologies is strong enough to 'pull' European industry into new lead markets.

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<sup>9</sup> 'Exploiting the UK science and technology base: how to fill the gaping hole in UK government policy', Dec 2004, David Connell, CEO TTP Venture Managers.

<sup>10</sup> The Fraunhofer Report, Report of the Independent Expert Group lead by Fraunhofer Institute – conducted for DG ENTR, 'Innovation and Public Procurement: Review of issues at stake', March 2006

<sup>11</sup> Report of JRC IPTS commissioned by DG INFSO, 'Public Procurement for the promotion of R&D in ICT', March 2006

<sup>12</sup> 'Shaping Europe's Future through ICT', ISTAG, March 2006, <http://www.cordis.lu/ist/istag.htm>

<sup>13</sup> 'Innovative Public Technology Procurement', Presentation moderating the discussion at the conference on Public Procurement stimulating Research and Innovation: Towards Best Practice, Mr. Stephan Corvers, 14 December 2005

'Procurement and Innovation: The Context', Presentation by Jakob Edler from Fraunhofer Institute at the conference on Public Procurement stimulating Research and Innovation: Towards Best Practice, 14 December 2005

## **2. Setting the Scene**

### **2.1. The Market Forces – Trade giants on the watch**

Public procurement makes up an important share (15-20%) of GDP in developed economies<sup>14</sup>. In 2002 the OECD<sup>15</sup> estimated the world total procurement market to be roughly equivalent to 82.3% of the world merchandise and commercial services exports. Today this amounts to \$5500Bn. The size of the world wide contestable<sup>16</sup> public procurement market roughly equals the size of the global ICT market (estimated around €2500Bn today).

The **WTO Government Procurement Agreement (GPA)**<sup>17</sup> forms the basis for regulating the procurement policies and practice of WTO GPA member countries. It is a "plurilateral" agreement, binding its signatories to comply with principles of non-discrimination and to implement procedural rules to guarantee it in those public procurements covered by individual signatories. Suppliers of each GPA member have the right to compete for other GPA members' government contracts, according to each Party's commitments contained in country specific Appendices of the GPA Annexes. All traditional developed economies (US, Canada, Japan, Korea, Hong Kong China, EU-25) except Australia and New Zealand are Parties to the WTO GPA. Though developing countries are allowed to have a "*special and differential treatment – such as promoting the establishment and development of domestic industries - in order to meet their specific development objectives*", none of them - including Mainland China and India have yet joined WTO GPA.

#### **2.1.1. WTO rules and International practices**

**Due to their pre-competitive nature, pre-commercial R&D services<sup>18</sup> are by definition an exception<sup>19</sup> case in the WTO GPA.** Only the US however has translated the WTO R&D exception in combination with the Buy-American restriction into explicit access restrictions to US controlled suppliers in US R&D public procurements. Besides excluding foreign suppliers, a predefined and growing part of the federal government R&D procurement market is set aside for example to Small Business Concerns (SBCs). All procurement contracts below \$100.000 have to be awarded to SBCs and 2,5% of procurement budget is reserved for high-tech innovative R&D carried out by SBCs. The US also makes use of the WTO R&D and defence exceptions to engineer specific lightweight acquisition procedures for R&D exempt from procurement regulations, such as the "Other Transactions"<sup>20</sup> procedure. "Other Transactions"<sup>21</sup> are contracts "other than" standard procurement contracts and financial assistance instruments such as cooperative agreements and grants to fund R&D including prototype projects. Most laws applicable to procurements, cooperative agreements, and grants are not applicable to contracts negotiated under "Other Transactions Authority." Although the dangers of such "government contracts without rules"<sup>22</sup> are well understood<sup>21</sup>, the use of Other Transactions – originally

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<sup>14</sup> For the OECD countries as a whole (2002 data), the ratio of total procurement (consumption and investment expenditure) for all levels of government is estimated at 19.96% or \$4 733 billion and for the non-OECD countries the ratio is estimated at 14.48% or \$816 billion. In Europe Public Procurement represents 16% of GDP (€1500Bn).

<sup>15</sup> 'The Size of Government Procurement Markets', OECD Journal on Budgeting, Vol. 1 No.4, OECD (2002)

<sup>16</sup> The contestable part of a public procurement market is the part opened by government to potential international competition.

<sup>17</sup> WTO GPA (Government Procurement Agreement) [http://www.wto.org/English/tratop\\_e/gproc\\_e/gp\\_gpa\\_e.htm](http://www.wto.org/English/tratop_e/gproc_e/gp_gpa_e.htm)

<sup>18</sup> Pre-commercial R&D for supplies and prototypes are excluded from the competition obligation but not from the non-discrimination obligation.

<sup>19</sup> Pre-commercial R&D for supplies and prototypes are excluded from the competition obligation but not from the non-discrimination obligation. R&D services are completely excluded from the WTO GPA.

<sup>20</sup> "Other Transactions Agreements for Prototypes "Opportunity for Teamwork", Susan Burkett, Carnegie Mellon University

<sup>21</sup> "Recommendations regarding the application of Other Transactions Authority within the Department of Energy", Secretary of Energy Advisory Board, September 2002: "*Other Transaction agreements may be drafted essentially from a "clean sheet of paper" and use commercial practices employed by the private sector. They provide for more flexible terms and conditions than standard financial management and IPR provisions typically found in standard contracts. "Other Transactions" agreements are contract instruments not subject to the federal laws and regulations governing procurement contracts. As such, they are not required to comply with the Federal Acquisition Regulation (commonly known as FAR), its supplements, or laws that are limited in applicability to procurement contracts, such as the Truth in Negotiations Act and Cost Accounting Standards.*"

<sup>22</sup> "Other Transactions for R&D Prototype Programs: A Government Contract without Rules", South African Law Center, 1997

launched in 1994 in DOD – has since its introduction steadily increased and spread over DOD, DARPA, NASA, DOT, HSARPA and DOE<sup>23</sup>. Other WTO GPA members such as EU-25, although they did not commit R&D services under WTO GPA either, appear not to be so concerned with innovation considerations in public procurement<sup>34</sup>, and award especially the big, cost sensitive ICT R&D contracts on an internationally competitive basis. Mainland China and India are a category on their own. Developing countries or not, they are fast growing world class R&D magnets. Their restrictions, requiring 50% of R&D in big public procurement contracts to be carried out by domestically controlled suppliers, exerts heavy pressure on EU suppliers, especially in the ICT sector which, due to its sheer pace of innovation and 'electronic portability' of R&D labour, is extremely sensitive to globalisation and delocalisation of R&D. The openness of the Japanese and Korean R&D procurement market is very limited.

All big trade blocks negotiated **exceptions in the WTO GPA annexes** protecting those parts of public procurement markets from international competition where their indigenous supplier base aspires to be world market leader. These are also ICT related. Although this paper is not proposing the EU uses these exceptions, it is important to be aware of them in the context of globalisation. Each WTO member defines its own list of ICT services subject to WTO GPA, according to the WTO secretariat<sup>24</sup>, subject to the application of reciprocity (e.g. US), exclusive licensing (e.g. Hong Kong China), non-application clauses (US only commits 'value-added telecom services'), limited sub-governmental coverage (e.g. Canada includes 0% of sub-governmental authorities), and above thresholds fixed individually by each GPA member. Preferential policies, not only in ICT, expose themselves as preferential price margins (often applied at sub-governmental level), set-asides (e.g. US set-aside: 23% of federal procurement market is reserved for disadvantaged businesses such as SBCs), local production requirements (e.g. wide application in China and India, application in US for R&D contracts), buy-domestic requirements (e.g. Buy-American and Buy-Canadian Acts), as well as non-technical barriers (e.g. China's new software procurement policies, according to the US Dept of State: "*to which no other supplier besides a Chinese one can possibly comply*"<sup>25</sup>), etc. The EU has specific WTO exceptions – permitting a local content requirement of 50%<sup>26</sup> - on parts of the utility sectors (water, electricity, airports, ports and urban transport). The US set-asides for SBCs are important to the US economy<sup>27</sup>, especially as the US SBC definition<sup>28</sup> is more flexible than the European SME definition<sup>29</sup> (max 250 employees + additional turnover/balance sheet and company autonomy requirements). The US SBC definition in commercial procurement varies across sectors and even sub-sectors to reflect industry differences and can range up to 1500 employees in the ICT sector<sup>30</sup> regardless of annual revenues.

### **2.1.2. Strategic use of Innovative and R&D procurements in the US, Asia and EU**

As public procurement of products and services represents more than 16% of GDP in **Europe**, it has significant economic leverage. In the field of ICT specifically, EU public expenditure is significant in both relative (about 20% of the IT market<sup>31</sup>) and absolute terms (around €87 billion in 2004<sup>32</sup>), and it is

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<sup>23</sup> DOD = Department of Defense, DOT = Department of Transport, DOE = Department of Energy, HSARPA = Homeland Security Advanced Research Projects Agency

<sup>24</sup> ITU-WTO workshop on Telecom and ICT regulation, GPA agreement, Roger Kamf, WTO secretariat, December 2004

<sup>25</sup> <http://www.state.gov/e/eb/rls/rm/2005/46950.htm>

<sup>26</sup> "EU Tenders", US Commercial Service in Italy, <http://www.buyusa.gov/italy/en/eupublicprocurement.html>

<sup>27</sup> "2000 Report on US barriers to trade and investment", EC, July 2000

<sup>28</sup> The Small Business Act states that a small business concern is "one that is independently owned and operated and which is not dominant in its field of operation." The law also states that in determining what constitutes a small business, the definition will vary from industry to industry to reflect industry differences accurately. SBC size tables are matched to the North American Industry Classification System (NAICS).

<sup>29</sup> In the EU an enterprise is an SME if it has (1) maximum 250 employees, (2) an annual turnover not exceeding 50 million euro, or an annual balance sheet total not exceeding 43 million euro, and (3) not more than 25% of the capital or voting rights are in hands of one of multiple enterprises that do not comply to this definition, with the exception of public bodies, venture capital companies and institutional investors as long as jointly or individually, they are not controlling the enterprise.

More info: [http://europa.eu.int/comm/enterprise/enterprise\\_policy/sme\\_definition/index\\_en.htm](http://europa.eu.int/comm/enterprise/enterprise_policy/sme_definition/index_en.htm)

<sup>30</sup> Examples of some ICT sub-sector SBC size limits: telecom carriers (1500 employees), device manufacturers (1000 employees), telecom equipment manufacturers (750 employees), software developers (500 employees)

<sup>31</sup> "European Information Technology Observatory 2005", EITO, 2005, ISSN 0947-4862

expected to grow as a result of current political objectives to increase efficiency and quality of public services, and the greater demand forecast for several application areas such as eGovernment, health and education, transport/utilities and traffic safety. The UK public sector, with total ICT expenditure estimated to reach €21 billion, is confirmed as the leading purchaser in Europe, spending about 40% more on ICT than France and Germany, mainly due to flagship projects such as “Connecting for Health”, “Criminal Justice IT Programme”, and the “Defence Information Infrastructure Project”. Denmark and Estonia have the highest spending in proportion to population and GDP respectively.

Gartner Group reported in 2003 that 65% of all expenditure in eGovernment is currently focused on maintaining current IT infrastructure, with a further 30% spent on enhancements to existing standards. Only 5% of all eGovernment expenditure is actually spent on technology-innovative projects.<sup>33</sup> A worldwide survey of business leaders, carried out for the World Economic Forum<sup>34</sup> (2003) provides data on public technology procurement. It assesses to what extent government purchase decisions are based on technology and to which extent they encourage innovation, rather than considering only the price. It shows Asian countries and the US have more explicit policies to orientate public demand towards promoting innovation.

The **Japanese** context has been strongly influenced by the proactive coordinating role of the Ministry of Economy, Trade and Industry (METI) in organising R&D procurement agreements (e.g. 3G mobile communications, Internet rollout). METI's<sup>35</sup> combined power as architect of industrial policy, arbiter of industrial problems and disputes, and regulator is very effective to strengthen the country's industrial base and develop an integrated cross-policy procurement strategy (e.g. coordinated procurement with Japanese Energy Ministry for fuel cells and other energy saving/substitution projects). METI is in charge of the administration of affairs related to foreign trade, industries, information, advanced technologies, environmental issues, energy, etc.

The **Korean** context has been strongly influenced by the Ministry of Science and Technology (MOST). MOST<sup>36</sup> has the responsibility of formulating national science and technology policies and plans, including the coordination and integration of other ministries' plans for science and technology development and deployment. The Korean IT 839 Strategy<sup>37</sup> clearly puts technology, specifically ICT, at the centre of the country's economic and societal transformation. MOST works in very close cooperation with Korean industry and the Korean central government procurement agency.

Apart from special WTO exceptions, the **US** R&D procurement success is mainly characterized by technology risk management (defence pioneering) and the early exploitation of economies of scale on the US home market. The US contestable public procurement market is of the same order of magnitude as the **EU** one<sup>38</sup>. Yet, the effectiveness of these two home procurement markets in pulling high-tech R&D into marketable innovations is very different.

#### R&D Procurement Expenditure gap

The US federal government procurement market<sup>39</sup> alone is of *comparable size* to the market of European wide tendered procurements<sup>40</sup> including defence. Although two markets with an equally strong *total* public procurement demand, there is a big gap in the public procurement demand for *R&D*.

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<sup>32</sup> 'ICT spend in European public sector to 2007', 2005, IDABC (based on data from Kable). Data are for the whole of the EU public sector (including also health, education, defence and transport). <http://europa.eu.int/idabc/en/document/4336/5860>

<sup>33</sup> Quoted in the report of the eGovernment Research Advisory Workshop - 8th December 2003, Brussels ([http://europa.eu.int/information\\_society/activities/egovernment\\_research/doc/8\\_dec\\_2003/eGovernment%20Research%20Advisory%20Workshop%20081203\\_v31.PDF](http://europa.eu.int/information_society/activities/egovernment_research/doc/8_dec_2003/eGovernment%20Research%20Advisory%20Workshop%20081203_v31.PDF))

<sup>34</sup> "The Global Information Technology Report", World Economic Forum 2002-2003

<sup>35</sup> Role of METI in Japan, <http://www.fas.org/irp/world/japan/miti.htm>, <http://www.meti.go.jp/english/>

<sup>36</sup> MOST, <http://park.org/Korea/Pavilions/PublicPavilions/Government/most/index.html>, <http://www.most.go.kr/>

<sup>37</sup> 'The Road to \$20000 GDP/capita: IT 839 Strategy', Ministry of Information and Communication, Korea ([www.mic.go.kr](http://www.mic.go.kr))

<sup>38</sup> 'The interaction between levels of rulemaking between public procurement, trade and investment', London School of Economics (Dec 2004) based on 2004 data from OECD

<sup>39</sup> 'US Federal Procurement Data System (FPDS), Federal Procurement Report 2004 Part III', [www.fpd.gov](http://www.fpd.gov)

<sup>40</sup> European wide tendered EU procurement market: all procurements by public agencies, utility companies etc through the Official EC Journal/Tenders Online Daily (European procurement database) + all EU wide collaborative defence procurements

In 2004, **US federal government agencies**<sup>41</sup> spent \$49Bn on US wide R&D procurements (15% of the total federal procurement budget). 90,6% of the US federal R&D procurements were defence/space related (DOD, NASA, DHS, etc), 9,4% civilian (4,26% on Health; 2,48% on Energy; 0,37% on Education; 0,25% on Transport, 0,14% on Environment).

In 2004, **EU wide tendered R&D procurements** (civilian<sup>42</sup> + defence<sup>43</sup>) accounted for approximately €1,64Bn (less than 1% of the total EU wide tendered procurement budget). 51% of the total amount of EU wide tendered R&D procurements were related to civilian R&D and 49% on collaborative European defence/space R&D (only 5% of the European R&D defence budget is spent in collaboration between Member States). Statistics showing the breakdown of R&D procurements per public sector (health, transport, energy, education, environment, etc) like in the US are not collected on a systematic basis in Europe. Data on EU wide procurements collected from the TED database<sup>44</sup> suggests that a large number of R&D procurements<sup>45</sup> in those public sectors are related to ICT technologies.

**Suppliers suffer from 20 times<sup>46</sup> less (approximately \$47 Bn) R&D procurement demand on the European market compared to US market. Although the biggest part of this difference is due to lower European defence spending, also in the civilian segment the factor of difference is not negligible: EU spending here is 4 times<sup>47</sup> less (approximately \$3, 4 Bn) than US spending. The factor 4 is in reality an underestimation as defence procurement spending has spill-over effects to civilian applications (e.g. thanks to dual-use technologies).**

**These figures point to the same conclusion as the preliminary results on an ongoing OECD study<sup>48</sup> which clearly shows that the biggest part of the double US-ED R&D investment gap is due to the underutilization of the public procurement instrument for R&D and not the financial assistance (e.g. R&D subsidies, loans and fiscal measures) instruments for R&D.**

#### Technology Risk Management

In sharp contrast with Europe the US has an explicit strategy and longstanding experience (originating from the defence sector) in the management and sharing of the risks inherent in 'pulling' new technologies from the research phase to the first pre-commercial volume batch of pre-products. NASA, DARPA and DOD are all world pioneers in high-tech procurement risk-management. For decades they have been optimising procurement practises<sup>49</sup> to stimulate innovation: design contests with skyrocketing prize awards (e.g. a better astronaut glove might earn its developers \$1 Million from NASA, \$2 Million DARPA Grand Challenge for autonomous ground vehicles etc), multi-thread procurements putting multiple suppliers in competition for exactly the same R&D assignment, splitting up R&D procurements into smaller manageable consecutive phases, the inclusion of risk versus cost

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<sup>41</sup> 'US Federal Procurement Data System (FPDS), *Federal Procurement Report 2004 Part III*, [www.fpds.gov](http://www.fpds.gov)

<sup>42</sup> The data on 'civilian' R&D procurements include all procurements by public authorities and utility companies on a European wide basis through the Official EC Journal/Tenders online Daily (TED = European procurement database). As the identification of R&D procurements depends on the procurer tagging the tender with an R&D flag in the TED database and on the procurers to specify to correct contract award value, there is a margin of error on the data.

<sup>43</sup> The data on 'defence' originate from the opening speech of G. Verheugen, Vice President European Commission, at the Research and Technology Conference, 9 February 2006.

<sup>44</sup> <http://ted.publications.eu.int>, TED = Tenders online Database = database of all EU-wide procured tenders

<sup>45</sup> As the identification of R&D procurements depends on the procurer tagging the tender with an R&D flag in the TED database and on the procurers to specify to correct contract award value, there is a margin of error on the data.

<sup>46</sup> Knowing that there is a margin of error on the data collected through TED, we take into account a margin of error of 50% - to be on the safe side not to underestimate gravely the European market - on the data collected through TED on European wide tenders. Then the value of EU wide tendered procurements amounts to around €2,5Bn instead of €1,64Bn and there is a factor of 20 times difference between the overall EU wide tendered R&D procurements (€2,5Bn) and the overall US wide federal government tendered R&D procurements (\$49Bn).

<sup>47</sup> 9,4% of \$49Bn amounts to approximately 4 times 51% of €2,5Bn

<sup>48</sup> These OECD results are explained on page 14-15 and Figure 3 of "Evaluating the comparing the innovation performance of the United States and the European Union", Expert Report prepared for the Trend Chart Policy Workshop June 2005

<sup>49</sup> Although the US Defence agencies only have to comply with DFARS - a stripped down version of the FAR (Federal Acquisition Regulation), the public procurement bible in the US - most of their risk-management techniques can be applied in Europe if appropriate.

quantification in the tenders/offers, the application of value engineering<sup>50</sup>, ingeniously constructed IPR/risk sharing agreements, etc.

Policy analysts identify **risk and IPR sharing** as a fundamental difference in US public procurement practice to that used by most major European governments, and regard it as **an important source of competitive advantage for US defence contractors in international markets**<sup>51</sup>.

The US Defence sector has a long track record of high-tech high-risk R&D procurements dating back to the sixties when the DOD pulled the semiconductor industry out of nowhere into a giant world power. More recent examples are world life-changing innovations like the Global Positioning Satellite and the Internet. Today defence procurement plays a role in advancing knowledge systems and power technologies. The DOD was also one of the earliest organisations to fund applications for nanotechnology<sup>51</sup>. Thanks to these success stories, the risk management techniques developed by the US defence departments have been taken over as good practices in other federal agencies (Department of Energy, Health, etc), for example in their generic department procurement guidelines. Because of their proven ability to manage high-tech risks while making a considerable contribution to the nation's competitiveness, big federal R&D departments year after year continue to obtain large shares of the US budget for high-tech high-risk procurements.

**In conclusion, US and Asia use pre-commercial public procurement of innovation strategically as a means to provide a strong home market for their domestic supplier base in well-defined areas of aspired international competitiveness. Compared to the US and Asia, European public procurement is underutilized as a means of boosting research and innovation in ICT. In the context of increasing global competition, the ongoing fragmentation of national public procurement policy objectives and practices, as well as the low attention to Research and Innovation in public procurement policies across EU Member States, are seen as a major European weakness.**

## **2.2. State of play in the Member States**

In November 2005, IPTS<sup>52</sup> was asked to carry out interviews with representatives from Member States to collect an overview of the **current situation in the EU-25 with regards to public procurement practices in support of ICT Research and Innovation**, in comparison with case studies from other parts of the world. Due to the limited time frame of the study<sup>53</sup>, **procurement experts from eight Member States were interviewed** (the UK, France, Germany, the Netherlands, Sweden, Belgium, Finland and Italy). Where possible, this chapter is enriched with data from other sources.

Detailed **quantitative analysis** of the level of support to R&D and innovation through public procurements around Europe is impossible, especially at sectoral and sub-sectoral level, as there is **no systematic mechanism** to collect such data **across the Community and Member states** at national, regional and local levels. Although Heads of State identified this as an issue of key importance at Hampton Court<sup>54</sup>, only a few countries – non-surprisingly those that put technology/ICT at the centre of government transformation – have actually indicated ongoing efforts towards monitoring technology procurement expenditure across government programmes (Netherlands, UK).

Interviewed national experts unanimously consider the **size of public procurement in support of research and innovation** as **marginal** in total public procurement. The main purpose of ICT

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<sup>50</sup> Value engineering (<http://ve.ida.org/ve/ve.html>) incentivizes the contractor to propose contract modifications which reduce cost without reducing product or process performance, thus limiting the risk of surpassing the project budget and realising savings when budgeted risks don't occur.

<sup>51</sup> "U.S. Defence R&D Spending: An Analysis of the Impacts", Rapporteur's report for the EURAB Working Group ERA Scope and Vision, January 2004, EURAB 04.011

<sup>52</sup> IPTS (Institute for Prospective Technological Studies), based in Seville, Spain is one of 7 research institutes that make up the Joint Research Centre of the European Commission.

<sup>53</sup> "Public Procurement for the promotion of R&D and Innovation in ICT", IPTS report on request of DG INFSO, March 2006

<sup>54</sup> Informal meeting of Heads of State or Government, Hampton Court Palace, 27 October 2005

procurement in the public sector is currently cost reduction in administration and maintenance of existing products and services.

Examples of innovative procurement highlighted by experts:

- The large scale deployment of electronic ID card in Belgium and Italy
- The Electronic Document Systems within the Federal Administration of Austria
- The Electronic Taxation System in Finland
- The 24/7 Multi-channel Public Service Delivery in Sweden
- The Electronic Patient Management System in the Netherlands

The *innovative* procurement examples quoted by the experts represent adaptations or improvements of existing solutions (incremental innovation) or even non-technological innovation characterised by organisational and management changes, rather than early stage innovation of emerging technologies. Experts agree that, although there are **more innovation-receptive niches (defence, health, transport and taxation)**, overall **public procurement is not really realising its innovation potential in Europe. More guidance and awareness building is still welcomed** (even in those countries where specific procurement policies exist) particularly with respect to the way research and innovation can be stimulated through public procurement (in combination or not with risk-incentives foreseen in new state aid framework for innovation).

While public procurement is undergoing an important modernisation across Europe, the Commission end 2005 review of the National Reform Programmes<sup>55</sup> confirms that “**very few Member States present plans to use public procurement to promote innovation**”. In terms of setting concrete targets only Portugal (plan to allocate 20% of large public contracts to R&D and innovation projects) is mentioned.

With regard to **SME involvement**, experts in Member States point to existing soft measures such as training and awareness, and simplification programmes. In addition, the United Kingdom has a policy on R&D procurement for SMEs and the Netherlands has started pilots similar to the US Small Business Innovation Research programme (SBIR<sup>56</sup>). In defence procurement, France gives special treatment to high-tech SMEs: provided they can prove they are the originators of an innovative technology, SMEs can directly conclude an R&D contract with the Ministry of Defence without having to face competition with large companies as the normal procedures would demand<sup>57</sup>. In Norway, since 1968 the OFU and IFU programmes aim to stimulate innovative SMEs and improve the quality or cost efficiency of public services through the acquisition of new technologies or solutions by promoting co-operation between a company and a public institution acting as customer. Here, the government supports the innovative purchase by the public authority financially<sup>58</sup>.

The UK SBRI<sup>59</sup> (launched in 2001) and Dutch SBIR<sup>60</sup> (launched in 2004) are pre-commercial R&D procurement programmes **covering feasibility study and R&D up to the prototyping stage**, just like in the first two phases of the US SBIR programme. The UK SBRI programme has not been as successful as hoped for, for several reasons according to UK Venture Capitalists<sup>9</sup>: it is run on a voluntary basis (unlike in the US, UK government departments are not obliged to participate nor to devote a predefined set of their budget to SBIR procurements), its risk-management strategy is not well-balanced (unlike in US SBIR, the UK SBRI programme requires the SME to have other sources of risk-funding available beforehand while there is no clear rule on IPR sharing etc) and it does not finance SBIR phase 3 (R&D phase between prototyping and commercial development, involving further R&D up to first non-commercial volume batch of pre-products validated in real-life field tests). Although the Dutch SBIR programme does not face the two first issues (it is a more direct copy of the US SBIR programme than the UK SBRI programme) and the first partial outcomes of the first Dutch SBIR pilot

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<sup>55</sup> “*Time to move up a gear*”; Communication from the Commission, Brussels, COM(2006) 30

<sup>56</sup> Small Business Innovation Research (SBIR), <http://www.sba.gov/sbir/>

<sup>57</sup> [http://trendchart.cordis.lu/tc\\_datasheet.cfm?id=8658](http://trendchart.cordis.lu/tc_datasheet.cfm?id=8658)

<sup>58</sup> [http://trendchart.cordis.lu/tc\\_datasheet.cfm?id=7484](http://trendchart.cordis.lu/tc_datasheet.cfm?id=7484)

<sup>59</sup> <http://www.sbri.org.uk/>

<sup>60</sup> [http://trendchart.cordis.lu/tc\\_datasheet.cfm?id=8840](http://trendchart.cordis.lu/tc_datasheet.cfm?id=8840) and <http://www.senternovem.nl/sbir/index.asp>

project (currently in phase 2) are encouraging, **UK VCs<sup>9</sup> and Business Analysts<sup>61</sup> predict that, in contradiction to the US where venture capital and large high-tech R&D budgets in federal government departments are widely available, in Europe this is not the case, and thus the strategic use of public procurement to provide home lead markets for new R&D innovations will only be successful on a large scale if also phase 3 type R&D is financed by public procurement.** With respect to the combined use of public procurement and innovation subsidy instruments, the Dutch<sup>62</sup> also started a test to award an innovation premium to government departments starting public procurements of innovative high-tech products.

In spite of increasing **aggregation** and co-ordination among actors through, for example, public procurement agencies (e.g. Finland, UK), these trends focus mainly on ICT commodity goods and services where joint procurement and economies of scale are easier to achieve. Thus, procurement remains **very fragmented**, not only at national level within and among different institutions and sectors (administration, health, education, defence, etc) but also at regional and local level, where a significant share of procurement is carried out. Aggregation at EU level, although perceived as an opportunity for innovation, remains limited to EU initiatives in eInfrastructures (such as Galileo, INSPIRE, eEarth or GEANT).

Although it is widely recognised that suppliers are more likely to propose innovative solutions if they can keep any related **Intellectual Property Rights**, experts indicate that generally, in Member States, governments keep the IPR in order to facilitate adoption by other departments and save money, although no distinction is made between IPR and rights of usage. However, in the UK, recent OGC<sup>63</sup> guidance recommends that intellectual property rights should ultimately rest with the party who is best able to exploit them. In the Netherlands, IPR rights are also awarded to SBIR suppliers.

Another important factor is the risk sharing between supplier and purchaser. Although there are many supporting documents and guidelines for risk management, for example in the UK in the context of Public Private Partnerships, they mainly address financial and management risks, not **risk-sharing for technological uncertainty**. In these cases, a risk is usually attributed to the party which exercises the most control over the project.

Experts often quote **awareness of end-user expectations** and **dialogue with the suppliers** as fundamental to improve the quality and innovation of the purchases, both before and during the procurement process. Specific provisions for dealing with **unsolicited proposals** (e.g. the UK "Ideas Portal"<sup>64</sup>) as well as communication platforms between government and ICT industry (e.g. UK "Concept Viability"<sup>64</sup> initiative) can help by identifying potential areas for exploitation of innovation which were not considered by - or known to - the public sector.

## **2.3. The Institutional Forces – A legal framework on the move**

### **2.3.1. The new Public Procurement Directives – Innovative Procurement**

In 2004 the Commission issued a **renewed Public Procurement legislative package**, clarifying, modernizing and simplifying the previous package into two Directives (2004/18/EC and 2004/17/EC). In September 2005 the Wilkinson Report<sup>65</sup> - an independent expert report conducted on the request of DG RTD Commission Services - identified options for Innovative approaches in practice and procedures of procurement based on the new opportunities offered by the 2004 Public Procurement Directives.

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<sup>61</sup> "Commercialising University Research", paper for ESRC Sustainable Technologies Programme, Chris Hendry (Cass Business School, London)

<sup>62</sup> <http://www.technopartner.nl>

<sup>63</sup> "Capturing innovation", Office of Government Commerce, London, UK 2004  
[http://www.ogc.gov.uk/embedded\\_object.asp?docid=1001717](http://www.ogc.gov.uk/embedded_object.asp?docid=1001717)

<sup>64</sup> The UK "Ideas Portal" is 'a mechanism for firms, inventors and researchers to submit unsolicited, innovative proposals to the public sector.' The UK "Concept Viability Initiative" is a service provided by the IT industry to help Public Sector clients take early market soundings to test the practicability of their ideas.

<sup>65</sup> The Wilkinson Report, Report of the Independent Expert Group lead by DTI - conducted for DG RTD, 'Public Procurement for research and innovation: Developing procurement practises favourable to research and innovation', September 2005

**Innovative Procurement** refers to **innovative approaches in "practice" and "procedures" of procurement** which results in innovative contractual procurement arrangements. Examples of innovative approaches in "practice" are Full Life Cost Assessment, Value Engineering, Joint Procurement, Design, Construct and Operate. Innovative approaches in "procedures" introduced by the new Public Procurement Directives are Competitive Dialogue<sup>66</sup> and Functional Specifications<sup>67</sup>. Acceptance of variant offers, design contests, transfer of IPRs from procurer to supplier, cost sharing between supplier and procurer, life cost assessment, value engineering, risk/cost assessment in tender/offers, subcontracting to SMEs etc were all theoretically possible before the new Directives, but apart from the design contests) not explicitly explained in the old Directives. In practice most of them were never used to a significant extent in Europe<sup>68</sup>.

- Functional or Performance Based Specifications<sup>69</sup>

This is undoubtedly the most useful improvement in the Directives in terms of fostering innovation. Unlike in the old Directives, where the use of functional and performance-based requirements needed to be explained and justified, the new directives have put them on the same level as references to standards. Improvements are made also in terms of the rules of evidence by which companies can prove their compliance. The freedom to provide equivalent evidence will make it easier for companies to prove that they are compliant with the requirement, without using the indicated standard means of evidence.

- Competitive dialogue<sup>70</sup>

This new procedure is an option '*in case foresight techniques have not been completed successfully, in the sense that the procurer finds it (still) objectively impossible to define the means of satisfying its needs or of assessing what the market can offer in terms of technical solutions and/or financial/legal solutions*'<sup>68</sup>. The procedure was not designed to tackle technological uncertainties of purchasing yet-to-be-proven technologies. It has proven very useful to tackle financial and legal uncertainties due to organizational complexity of big projects (e.g. big ICT infrastructure deployment projects<sup>71</sup>), especially for clarifying financing details and legal make-up which cannot be defined in advance without a dialogue with potential suppliers.

Figure 1 shows the typical Research and Innovation life cycle to transform a new idea into a commercial product or service. The R&D risk level associated with each stage of the life cycle is indicated on the graph. The research and development work carried out in phases 1 to 4 increases step by step the Technology Readiness Level<sup>72</sup> of the R&D results: initial idea, solution proposal, prototype, pre-commercial product/service (also called pre-product/service), commercially ready product/service.

<sup>66</sup> A new procedure within the context of Directive 2004/18/EC, if implemented by the Member States

<sup>67</sup> See the Wilkinson report for a more detailed overview of innovative approaches

<sup>68</sup> For an analysis of the potential of the new Innovative Procurement features in the 2004 Public Procurement Directives, refer to the report in footnote 62. For an overview of the limited use of Innovative Procurement in MS, refer to report in footnote 50.

<sup>69</sup> Functional or performance based specifications make it easier for the purchaser to express their needs not in terms of specific standards or solutions, but as functional specifications. In this way, the tender does not pre-define the technical solution, but is open to alternative technical ways to address the needs as expressed in the technical specification. The suppliers can therefore propose alternative and innovative technical solutions.

<sup>70</sup> Competitive dialogue is a flexible procedure which preserves not only competition between economic operators, but also the need for the contracting authorities to discuss all aspects of the contract with each candidate.

<sup>71</sup> Based on TED database (status 20 February 2006) in the first four months of the introduction of the competitive dialogue instrument, it has been used only in 6 member states (France, Denmark, UK, Germany, Italy and Malta) and only in 64 tenders out of 79682 (0,1%). Big infrastructure projects, in particular ICT, are the main application area of "competitive dialogue": 22 out of 64 were on "IT/software", 1 on "broadcast" and 1 on "telecom". Also 17 tenders were on civil engineering construction works.

<sup>72</sup> Technology Readiness Levels (TRLs) are used widely in the defence/space sector, e.g. by NATO. The TRLs delineate the distance the R&D results are still away from the final TRL which is 'ready for commercial operation' (For a detailed description of the NATO TRLs go to <http://www.saclantc.nato.int/trl.html>). The NATO TRLs can be mapped to the 5 risk levels/TRL levels in Figure 1.

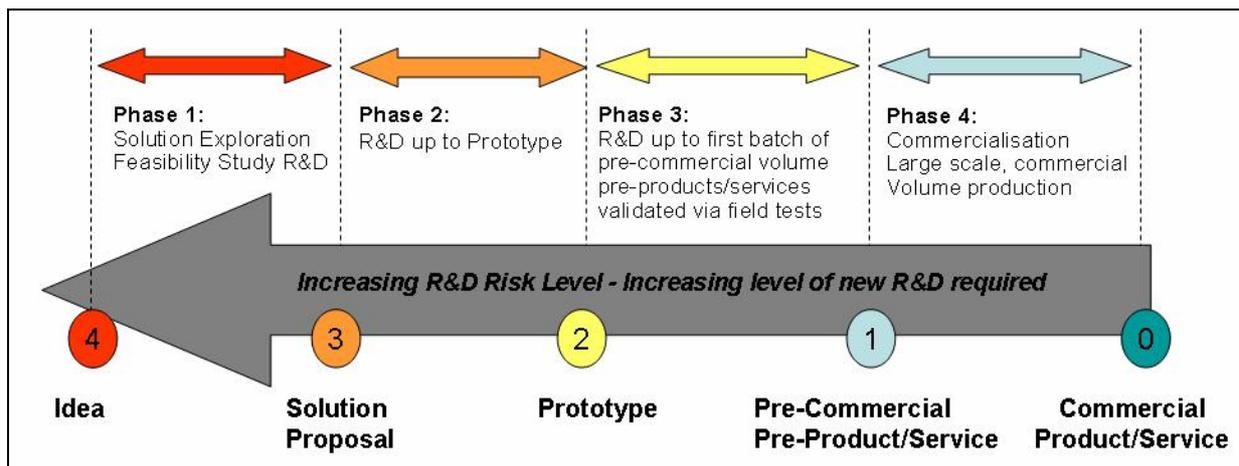


Figure 1: Typical Research and Innovation life-cycle transforming an idea into a product/service

Unlike in the US, **explicit guidance on European public procurement is linked to procuring commercially ready products**. The bulk of government procurements are of R&D risk level '0' (Figure 1). The new features in the 2004 Directives that can stimulate innovation - through so-called Innovative Procurement - are **designed to limit contractual and financial uncertainties, not to tackle the technological uncertainties associated with purchasing completely from-scratch yet-to-be-developed technologies**. By removing some of the barriers that prevent procurers from retaining the more innovative proposals in a commercial tendering process, Innovative Procurement may have the power to make open-minded public procurers buy 'innovative' products *for which the financial and technological development risks can be ascertained within controllable limits of uncertainty from beforehand*<sup>73</sup>: *pre-products/services of R&D risk level '1'*(Figure 1). Innovative Procurement thus **ensures the take-up (phase 4) of pre-commercial R&D outcomes** which are ready to be commercially deployed (risk level '1'). Innovative Procurement can **indirectly contribute to increased investment in R&D** (by encouraging suppliers to step up phase 4 type R&D efforts). In order to raise awareness of the new possibilities for innovation-friendly tendering under the new Public Procurement Directives, Commission Services are preparing a Handbook on Procurement and Innovation<sup>74</sup>.

### **2.3.2. The new State Aid Framework for R&D and Innovation – Promoting Risk Taking and Technological Experimentation**

For the financing of pre-commercial R&D activities (risk level '4' to '1' corresponding to R&D phases 1 to 3 in Figure 1), the European public sector relies mainly on **subsidy type schemes** up to now. However, **State Aid resources** can only be used *proportionally* to the gravity of a *well-identified market failure* if this can not sufficiently be tackled by other less competition/trade distortive policy instruments (e.g. regulatory).

#### **Current State Aid Framework for R&D<sup>75</sup>**

*Research and Development Activities* - especially at European level when requiring cross-border cooperation between Member States - are recognized by the State Aid Framework as market failure, due to the *coordination problems and the nature of innovation as a public good*.

According to the ex-ante rules in the current State Aid for R&D Framework total official support (sum of community and state financing where these are combined) may not exceed 75% in the case of 'Industrial Research' and 50% in the case of 'Pre-competitive Development' activities. These maximum aid intensities are authorized by the WTO Agreement on Subsidies and Countervailing Measures<sup>76</sup>.

<sup>73</sup> Feedback from IPTS MS interviews: Even the few countries that developed national risk management guidelines (e.g. UK for public-private partnerships) address only financial and management risks, not risk-sharing for technological uncertainty.

<sup>74</sup> "Handbook on Procurement and Innovation", due 2<sup>nd</sup> half 2006, under preparation by DG ENTR, RTD and MARKT Commission Services

<sup>75</sup> Community Framework for state aid for research and development (96/C 45/06).

<sup>76</sup> "WTO Agreement on Subsidies and Countervailing Measures", [http://www.wto.org/English/docs\\_e/legal\\_e/24-scm.pdf](http://www.wto.org/English/docs_e/legal_e/24-scm.pdf)

- '*Industrial Research*' covers planned research or critical investigation aimed at the acquisition of new knowledge useful in developing new products, processes or services or in bringing about a significant improvement in existing products, processes or services.
- '*Pre-competitive Development*' covers the conceptual formulation, design and shaping of the results of industrial research into a plan, arrangement of design for new, altered or improved products, processes or services, whether they are intended to be sold or used, including the creation of an initial non-commercially usable prototype. It does not include the routine or periodic changes made to products, production lines, manufacturing processes, existing services and other operations in progress, even if such changes may represent improvements.

### **New State Aid Framework for R&D and Innovation**

In its consultation on the new State Aid Framework for R&D and Innovation<sup>77</sup>, due to enter into force at the beginning of 2007, the Commission proposes new measures to promote risk-taking and experimentation

- supporting creation and growth of innovative start-ups (through tax exemptions and subsidies)
- additional flexibility for state aid to risk capital
- expanding the scope of the current state aid rules for R&D (limited to technological innovation)

Bonuses for cross border cooperation and dissemination are also foreseen.

The Commission recognizes *Technological Innovation* as a new market failure eligible to State Aid. Technological Innovation<sup>78</sup> refers to products and processes that are technologically new or substantially improved by comparison with the previous state of the art in this industry in the Community, and which carry a risk of technological or industrial failure.

The consultation proposes to extend the ex-ante State Aid R&D definition with '*Experimental Development*' activities for R&D projects related to technological innovation. The extended definition will enable (national as well as Community) R&D state aid to go well beyond today's limit of the first non-commercially usable prototype, as 'Experimental Development' includes:

- the development of commercially usable prototypes and pilot projects for the purpose of conducting technological and/or marketing experiments, where the prototype is necessarily the final commercial product and where it is too expensive to produce for it to be used only for demonstration and validation purposes
- technical evaluations and feasibility studies preparatory to the launch of a new product, which will include the costs for software and computer modeling for the purpose of conducting technological and/or marketing experiments
- testing and laboratory costs
- expenses for adapting technologies to particular production specifications and for optimizing the production process, up to the production of the first pre-series batch
- marketing costs related to technological design
- management and marketing training

The enlarged State Aid R&D definition covers the first three phases (pre-commercial part) of a typical R&D project life cycle depicted in Figure 1.

## **3. Pre-commercial Procurement of Innovation**

### **3.1. What is Pre-commercial Procurement of Innovation?**

<sup>77</sup> Consultation on the State Aid Framework for R&D Innovation (see also *IP/05/1169* and MEMO/05/333) is published at [http://europa.eu.int/comm/competition/state\\_aid/others/action\\_plan/cdsai\\_en.pdf](http://europa.eu.int/comm/competition/state_aid/others/action_plan/cdsai_en.pdf)

<sup>78</sup> Definition used in consultation: According to the Oslo Manual page 9: A **technological product innovation** is the implementation/commercialisation of a product with improved performance characteristics such as to deliver objectively new or improved services to the consumer. A **technological process innovation** is the implementation/adoption of new or significantly improved production or delivery methods. It may involve changes in equipment, human resources, working methods or a combination of these. (Oslo Manual: Proposed Guidelines for Collecting and Interpreting Technological Innovation Data.; 1997; OECD and European Commission, available at <http://www.oecd.org/dataoecd/35/61/2367580.pdf>)

Innovation is the transformation of an idea into a marketable product or service (phases 1 to 4 in Figure 1). Consistent with the definition used in the proposed new State Aid framework on Innovation, **Technological Innovation** refers to that type of Innovation which draws upon technology, in casu Information and Communication Technologies (ICT). **Technological Innovation** is thus the transformation of new idea into a marketable product or service via **technological R&D**. In what follows Innovation is used in short for Technological Innovation.

**Pre-commercial Procurement of Innovation** refers to the procurement of Technological Innovation up to and including a first pre-commercial volume batch of products and/or services validated via field tests. Pre-commercial Procurement of Innovation involves **direct public R&D investment** in the first three phases (pre-commercial part) of a typical R&D project life cycle (Figure 1). Innovative Procurement, corresponding to phase 4 in the typical R&D project life cycle, is a very important complement to Pre-commercial Procurement of Innovation to ensure wide take-up of newly developed pre-commercial R&D pre-products/services. It is clear that Pre-commercial Procurement of Innovation involves a higher **degree of risk** than Innovative Procurement; both in terms of technological risks (require earlier stage R&D, prototyping, testing, etc) and/or in terms of non-technological risks (more uncertain return on investment period, higher risk of uncertainty in cost estimations, etc). The way to get Pre-commercial Procurement of Innovation going is **to share, not only the risks, but also the benefits** between procurers and suppliers. This makes Pre-commercial Procurements of Innovation eligible to a certain level of State Aid for Innovation.

### **3.2 Why are Innovative Procurement and State Aid instruments alone not enough?**

**Explicit guidance on European public procurement is linked to procuring commercially ready products** (risk level '0'). The new features in the 2004 Directives that can stimulate innovation - through so-called **Innovative Procurement** - are designed to limit *contractual and financial uncertainties*, not to tackle the *technological uncertainties* associated with purchasing completely from-scratch yet-to-be-developed technologies. They may have the power to make open-minded public procurers buy 'innovative' products *for which the financial and technological development risks can be ascertained within controllable limits of uncertainty from beforehand*<sup>79</sup> (risk level '1'). Innovative Procurement thus **ensures the take-up (phase 4) of pre-commercial R&D pre-products/services** which are ready to be commercially deployed (risk level '1').

- The more *intensive research* a project still requires, the more difficult it is to objectively compare competitive offers purely on the basis of written (**functional specifications**) or, exceptionally, oral explanation (**competitive dialogue**). You need to compare *working prototypes*, validate how new designs work in *real field tests* etc. Also, the competitive dialogue procedure doesn't allow the procurer to incorporate fundamental lessons learnt from the dialogue because it is not allowed to change the tender request after the competitive dialogue, only to add clarifications.
- **IPR and cost sharing agreements** are very powerful means to tackle the technological risks of R&D intensive projects. However there is a lack of Community guidance.

In conclusion, even with the new innovation-related features, it is not clear from the explicit guidance on European Public Procurement how to turn public procurement into a powerful tool optimized to 'pull' truly innovative R&D projects of risk level '4' to '2' into deployment. Indeed, because of their 'pre-commercial' nature (inability to guarantee final product quality and price) innovative R&D solutions of risk level '4' to '2' can not compete on equal basis with off-the-shelf / ready-made solutions in a framework designed for commercial procurement.

**State Aid for R&D** on the other hand **lacks the involvement of a first buyer as it is a 'technology push' instead of a 'market pull' instrument**. In addition State Aid can only be used *proportionally* to the gravity of a *well-identified market failure* in case it can not sufficiently be tackled by other less competition/trade distortive policy instruments (e.g. regulatory). And even then, state aid for R&D is

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<sup>79</sup> Feedback from IPTS MS interviews: Even the few countries that developed national risk management guidelines (e.g. UK for public-private partnerships) address only financial and management risks, not risk-sharing for technological uncertainty.

*not designed with the legal and contractual characteristics of a 'purchasing' tool like Public Procurement.*

- **Pushing research out on the market** without the involvement of a **first buyer** has been tried in the EU R&D Framework Programme 5 with very mixed results. Public Procurement has the advantage of explicit user involvement from the early stages of the project.
- State Aid for R&D is essentially a **co-financing** instrument (supplier always covers part of the costs himself) designed to assist firms to carry out R&D in line with company roadmaps, not R&D specifically tailored to meet specific public sector purchasing needs. As public procurement **covers 100% of the eligible costs defined in the contract**, this entitles the public authority to **define as precisely as desired the problem and boundary conditions to be addressed by the R&D** as well as concrete milestones and outputs to be delivered. Public Procurement enables procurers to focus the scope of the R&D activities to their purchasing needs. State Aid for R&D is the ideal instrument as an assistance mechanism to support bottom-up exploratory research in less narrowly specified research domains.
- An R&D subsidy is essentially a **one-way agreement** without an obligation for the receiver of the subsidy to deliver a specific result in the end. Procurements are **two-way agreements** with contractually bound project deliveries.
- Public procurement enables public authorities to **take the initiative** to start the procedure whenever they want. In case of state aid/subsidy the initiative to make a project proposal and how to specify it has to come from the company, not the public authority.

**State Aid for Innovation** only provides risk-incentives as a bonus to reward engagement in pre-competitive R&D activities, not the financing for the pre-competitive R&D itself.

**Conclusion: There is a missing link in the European Innovation cycle which is essential to really pull completely new 'yet-to-be-designed' technology research (risk level '4') up to the acceptable risk level 'tested to comply with commercial quality requirements' (risk level '1') suitable for innovative procurements. This missing link is Pre-commercial Procurement of Innovation.**

If the whole objective is to use public demand more strategically and very targeted to provide lead markets for new innovative ICT R&D solutions in specific public sector domains, then experience shows<sup>80</sup> that a purchasing instrument (Public Procurement) is more effective than a subsidy instrument (State Aid for R&D). **State Aid for Innovation** is useful to reward the risk-taking associated with innovation and to encourage coordination and cooperation between Member States, but **Public Procurement** is needed as the baseline legal instrument for acquiring the new R&D involved with Pre-commercial Procurement of Innovation. Because of the inherent risk-aversion of public procurers, we need a **specific strategy for Pre-commercial Procurement of Innovation** based on **sharing of risks and benefits of the pre-commercial R&D activities**. We need **specific legal guidance** which does not regard Pre-commercial Procurement of Innovation as a regular commercial procurement activity but as a separate pre-commercial public purchase which situates itself in the prolongation of the research phase, and is thus eligible for a certain level of State Aid for Innovation from the public side.

### **3.3. How to approach Pre-commercial Procurement of Innovation?**

#### **3.3.1. The legal basis for a 'European' Programme**

The **new 2004 Public Procurement Directives**, 2004/18/EC and 2004/17/EC, are the legal basis for public procurements by public authorities and utility companies respectively. In order to ensure the opening-up of public procurement to **global competition**, in respect of the **WTO Government Procurement Agreement**, all procurements above the threshold values defined in the Public

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<sup>80</sup> Experience from US pre-commercial procurement type programmes (e.g. NASA/DOD and SBIR programmes). EU Experience on the small impact of R&D subsidies on opening up new lead markets for European R&D.

Procurement Directives have to be published European wide in the Official EC Journal and the TED<sup>81</sup> databank in all official Community languages. Strict procedures have to be followed to make sure that all bidders regardless of nationality are treated equally in the procurement process.

Public service contracts for R&D services are **an exception to the Public Procurement Directives**, unless the benefits of the R&D are completely for the contracting authority *and* the R&D is fully paid by the contracting authority<sup>82</sup>. Because of its '**Shared R&D Risk – Shared R&D Benefits**' characteristic, Pre-commercial Procurement of Innovation falls under this exception. As the definition of R&D in the EU Public Procurement Directives<sup>83</sup> falls within the WTO definition<sup>84</sup>, R&D procurements not covered by the Directives are also not covered by the WTO GPA agreement, and thus openness to competition from outside the EU for pre-commercial R&D procurements is not mandatory. This means that access to the Pre-commercial Procurement of Innovation scheme **can be limited to European/EEA<sup>85</sup> companies<sup>86</sup> (in the case of consortia of bidders, limited to consortia lead by a European/EEA company)**, as in the European Research Programme. In the case of pre-commercial procurement however, the Working Group proposes to apply a set of participant eligibility criteria different from the ones for the European Research Programme (see chapter 3.3.4). The criterion related to the European/EEA characteristic of the company is not related to the company's principal place of business, establishment or ownership but to the company's commitment to locate the 'centre of gravity' of the relevant R&D as well as operational activities related to the pre-commercial procurement contract in the EEA.

It is important to note that the exception<sup>82</sup> only applies to R&D contracts of the type 'public **service contract**<sup>87</sup>', meaning that restricting access to European/EEA companies is only possible as long as the total value of the R&D services in question exceeds that of the total value of products and works – if any – covered by the Pre-commercial Procurement of Innovation contract. If this requirement is not fulfilled, the pre-commercial process described in chapter 3.3.2 can still be used but without the de facto restriction to European/EEA companies enabled by exception<sup>82</sup>.

**Pre-commercial Procurement of Innovation** is an R&D procurement of the type 'public **service contract**' because it refers to acquisition of knowledge – collected by the supplier by carrying out intellectual investigation services (R&D services) consisting of critical solution analysis, prototyping, field testing and small scale pre-product/service development – with the objective to prove the feasibility or unfeasibility to transform a technologically innovative idea into a first working batch of pre-commercial volume and quality pre-products/services according to the requirements in the tender specifications. As the definition of R&D services in the Directives<sup>88</sup> ranges from 'research (laboratory) services' through 'experimental development services' up to 'design and execution of research and

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<sup>81</sup> *Tenders Electronic Daily*, the European on-line tender database (<http://ted.publications.eu.int/official/>)

<sup>82</sup> Article 16 (f), Directive 2004/18/EC and Article 24 (e), Directive 2004/17/EC: *'This Directive shall not apply to public service contracts for research and development services other than those where the benefits accrue exclusively to the contracting authority for its use in the conduct of its own affairs, on condition that the service provided is wholly remunerated by the contracting authority.'*

<sup>83</sup> The definition of R&D in the EU Common Procurement Vocabulary (Regulation No 2195/2002) includes 'research and experimental development services' as well as 'design and execution of research and development'. The Public Procurement Directives mention explicitly under R&D: research, experimentation, study or development which does not extend to quantity production to establish commercial viability, ensure profitability or to recover research and development costs.

<sup>84</sup> The WTO GPA R&D definition includes research, experiment, study and/or original development. Original development of a first product or service may include limited production or supply in order to incorporate the results of field testing and to demonstrate that the product or service is suitable for production or supply in quantity to acceptable quality standards. It does not extend to quantity production or supply to establish commercial viability or to recover research and development costs.

<sup>85</sup> EEA refers to the European Economic Area ([http://europa.eu.int/comm/external\\_relations/eea/](http://europa.eu.int/comm/external_relations/eea/)). A more elaborate definition of what is meant by 'European/EEA companies' is outlined in chapter 0

<sup>86</sup> EEA refers to the European Economic Area ([http://europa.eu.int/comm/external\\_relations/eea/](http://europa.eu.int/comm/external_relations/eea/)).

<sup>87</sup> Quoting article 1 (definition of public service contract) of the EC Directive 2004/18/EC: 'Public service contracts' are public contracts other than public works or supply contracts having as their object the provision of services referred to in Annex II. A public contract having as its object both products and services within the meaning of Annex II shall be considered to be a 'public service contract' if the value of the services in question exceeds that of the products covered by the contract.

<sup>88</sup> According to Annex II of the EC Directive 2004/18/EC under R&D services are classified: 'research services', 'research laboratory services', 'experimental development services' and 'design and execution of research and development'.

development', the R&D public service contract can cover all three pre-commercial phases of the typical R&D project life cycle (Figure 1).

Restricting the pre-commercial R&D phase to Europe/EEA will **eliminate the competitive advantage some third countries like the US, China, Korea and Japan have today** by protecting their pre-commercial R&D procurements to domestic suppliers. It will give European/EEA suppliers equal chances to compete in commercial (Innovative) Procurements which follow after the Pre-commercial Procurement of Innovation process. In contrast to Pre-commercial Procurement tenders (phase 1 to 3 of the typical R&D life cycle) access to an Innovative Procurement tender (phase 4) can not automatically be restricted to Europe/EEA on the basis of the R&D exception in GPA, as here commercial procurement rules apply. Beyond pre-commercial procurement of innovation the degree of required openness to international competition depends on whether the procuring entity and the subject of the procurement contract are covered by the GPA

Although contracts not covered by the Public Procurement Directives are not obliged to European wide tender publication, the fundamental Treaty principles of objectivity, equal treatment and **non-discrimination between Member States** still apply<sup>89</sup>. As fostering of innovation through competition amongst European bidders is one of the main goals of pre-commercial procurement, we propose – although it is not mandatory in exception cases to the Directives - to publish calls for tenders at the launch of new pre-commercial procurements as **European-wide open procurements**, using the 'non-mandatory publication' feature foreseen in the Directives<sup>90</sup>.

Nothing prevents Member States to develop their own scheme for Pre-commercial Procurement of Innovation. The fundamental Treaty principles of non-transparency, objectivity and discrimination are however applicable and thus the procurers have to accept **European-wide offers**. The tenders have to be published in an 'adequate' way, an obligation which indicates that the exploitation of EC supported research demands a European-wide publication.

In its consultation on the **new State Aid Framework for R&D and Innovation**<sup>77</sup>, the Commission has proposed new mechanisms for supporting innovation, in particular measures **encouraging risk-taking and experimentation in the field of technological innovation**. The latter is enabled by **extending the current State Aid definition of R&D** up to the WTO definition of R&D. This enables the Community to reward groups of procurers for taking the risk of procuring not-yet-proven technologies with **a risk-incentive for the whole Pre-commercial Procurement of Innovation process**. In particular for projects addressing an important problem of common European interest such a Community incentive seems appropriate.

### **3.3.2. Positioning in an end-to-end procurement process geared towards Innovation**

How does pre-commercial procurement of innovation fit into an end-to-end public procurement scheme geared towards Innovation? Several schemes and variations of schemes are possible within the legal constraints. In what follows we explain one example of a scheme that we propose to be applied at European level. It should be understood that this is a proposed procedure and not the only possible legal procedure.

The starting point is that **a group of European procurers**<sup>91</sup> (called hereafter the Group of Procurers) decide to work together to **pool public demand** for procuring specific innovative ICT solutions which require new R&D. The Group of Procurers identifies procurement needs with a clear European

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<sup>89</sup> Mentioned explicitly in Public Procurement Directives 2004/18/EC (Article 2) and 2004/17/EC (Article 10)

<sup>90</sup> Article 37 in 2004/18/EC allows public authorities to publish notices of public contracts which are not subject to the publication requirement laid down in this Directive in the Official EC Journal.

<sup>91</sup> In what follows, we continue to speak about public authorities (Directive 2004/18/EC), but the same Pre-Commercial Procurement for Innovation process could be used by utility companies (Directive 2004/17/EC).

dimension for which the introduction of new ICT technologies plays an important role in dialogue with stakeholders such as the research community and future end-users.

### A. Problem definition, identification and specification of the R&D required

In order to make sure that the procurement takes into account all **user requirements** from the beginning, the stakeholders assist the Group of Procurers to formulate a **common well-specified tender request**. The request addresses 'an important problem of common European interest', for which a substantial amount of new ICT R&D is required. The target is to deploy a solution in a timescale of 5 to 6 years. Establishing an **explicit communication channel between the Research and Innovation and the Procuring departments** in the Group of Procurers helps to raise the number of 'Intelligent Customers': The R&I side informs the procurers about new upcoming promising ICT R&D technological developments with an interesting business case. In return, early feedback from procurers (potential buyers) provides invaluable insights into the effectiveness of the ICT research portfolio. The innovation department can pro-actively use risk-incentives to reward procurers for engaging in pre-commercial procurements.

### B. Joint Pre-commercial Procurement of Innovation

To share the risk of 'pulling' the new ICT technologies from the research phase to the first non-commercial volume batch of pre-products/services, the Group of Procurers engages in a "Pre-commercial Procurement of Innovation" process. R&D risks are mitigated on both sides by sharing risks and benefits between procurers (the Group of Procurers) and suppliers (see chapter 3.3.3 for more detail).

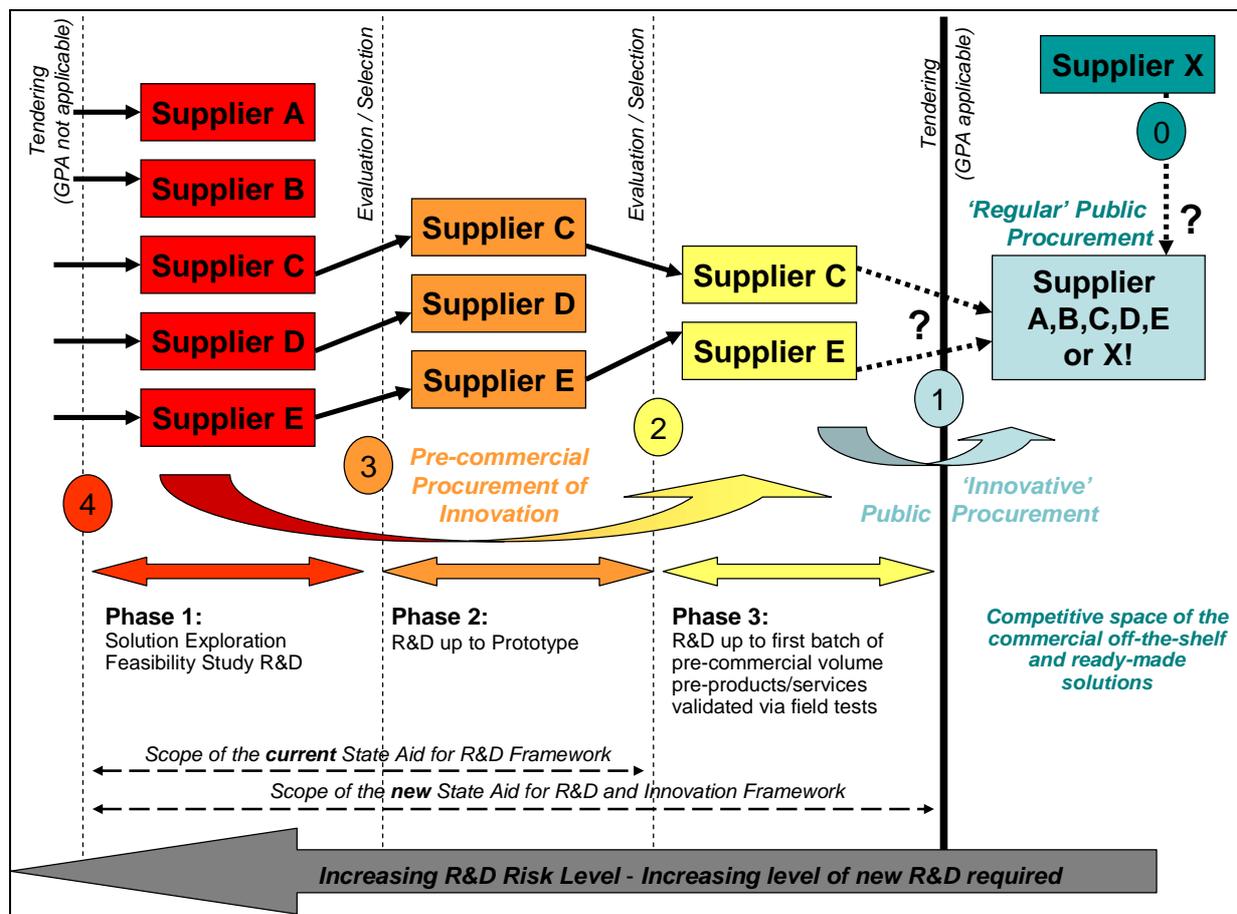


Figure 2: Pre-commercial Procurement of Innovation: A phased shared risk/shared benefit approach

To tackle the technological uncertainties inherent to procuring yet-to-be-developed technology in manageable steps, the working group proposes a three-stage process (Figure 2), each stage with multiple suppliers in competition (like similar programmes in the US):

- **Phase 1:** Solution Exploration / Research (min 3-5 competing suppliers)
- **Phase 2:** R&D up to Prototype (min 2-3 competing suppliers)
- **Phase 3:** R&D up to first pre-commercial volume batch of pre-products/services validated in a field test series (min 2 competing suppliers)

At the end of phase 1 and phase 2 an evaluation filters out the best projects based on their performance in the previous phase and the 'quality' of the project proposal for the next phase. The 'quality' criterion assesses the project's degree of technological innovation, commercialisation potential and the ability to address the problem of public interest posed in the tender. Once the three-step process is started, normally no other suppliers would be asked to submit offers. For each of the three phases of the pre-commercial procurement process a fixed price is predefined in the initial tender publication. The companies are bidding in competition based on a joint tender request from the Group of Procurers.

Technically speaking the three-stage pre-commercial procurement process is implemented as a single public procurement procedure – of the type 'Public service contract for R&D services' – with two intermediate evaluation points. The definition of R&D services in the Directives<sup>92</sup> ranges from 'research (laboratory) services' through 'experimental development services' to 'design and execution of research and development', thus covering all three phases of the pre-commercial procurement process.

Figure 2 shows the life-cycle of a project that starts from scratch, from the early research stage of solution exploration. In cases where state-of-the art research in the Community has already progressed beyond risk-level 4, the pre-commercial process does not have to be started at phase 1, but can start at phase 2 or even at phase 3.

The process proposed in this chapter is an example of a scheme for pre-commercial procurement of Innovation which falls within the legal framework. Although it is possible that Member States develop other alternatives or variations on this proposal, the working group proposes that Member States follow the process described in this chapter, as a common approach across Europe would be welcome.

To encourage an organic wave of innovativeness in the supplier base, market demand is pooled up to contract values that trigger supplier imagination. Nevertheless, to make sure that the pooled market demand also **opens opportunities for SMEs**, the Group of Procurers requires and helps suppliers to advertise parts of the contract which can be subcontracted to SMEs.

To make sure that the exercise results in products and/or services that can be deployed in 5 to 6 years, the three consecutive phases in the pre-commercial procurement process each have a **well-specified focus** and a **limited duration**.

- The aim of **Phase 1** (~ 6 months) is to verify the technical, economic and organisational feasibility of the proposal against the pros and cons of potential alternative solutions, as well as its ability to solve the problem of public interest. The output of phase 1 includes a technology evaluation, as well as an organisational plan (how to plan the R&D in phase 2) and an estimate of economic impact of the proposed solution (development costs versus market potential).
- In **Phase 2** (~ 2 years) the actual development starts, up to the realisation of a first not yet commercially usable prototype. The main outputs of phase 2 are a product specification, a tested prototype and a production plan (limited production). In phase 2 the preliminary business plan of the company is also scrutinized.
- In **Phase 3** (~ 2 years) research and development continues beyond the first prototype up to a first batch of pre-products/services (pre-commercial volume production) that are validated

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<sup>92</sup> According to Annex II of the EC Directive 2004/18/EC under R&D services are classified: 'research services', 'research laboratory services', 'experimental development services' and 'design and execution of research and development'.

through field tests and *original development*. Quoting the terminology used in WTO GPA rules for the last stage of pre-competitive R&D falling under the WTO R&D exceptions: "*Original development of a first product or service may include limited production or supply in order to incorporate the results of field testing and to demonstrate that the product or service is suitable for production or supply in quantity to acceptable quality standards. It does not extend to quantity production or supply to establish commercial viability or to recover research and development costs*". In step 3 the companies are evaluated also against their full business and production plans (for full scale volume production), marketing and communication plans as well as their ability to attract interest from investors/first buyers. This last evaluation criterion assures the take-up (diffusion) of solutions at the end of phase 3 into commercial operation. This ensures the link between Pre-commercial Procurement of Innovation (risk level '4' to '1') and Innovation Procurement (risk level '1' to '0').

The three consecutive steps are a **learning process**, for the suppliers as well as the potential buyers. It enables the potential buyers (the Group of Procurers) to evaluate the pros and cons of the proposals from different suppliers. Each step helps the Group of Procurers to adapt and fine-tune the requirements for the **common specifications**, which they all agree should form the basis of any subsequent commercial procurement for the rollout of the final product/service. In the final pre-commercial procurement phase 3 at least two contractors would remain to ensure a future competitive market.

### **C. Innovative Procurement of the commercial solution according to common specifications**

After the pre-commercial phase is concluded, the solution is commercially ready to compete in a commercial procurement. When found suitable, the public authorities in the Group of Procurers can now act as first buyers, individually or collectively, for the solution based on the technologies developed in the pre-commercial phase by launching a **procurement procedure based on the common specifications**.

Organisationally speaking, it is up to the public authorities to organise themselves in the format best suited for their specific sector to launch the commercial procurement procedure based on common specifications. Different formats are possible: joint procurement via a common procurement agency, synchronised procurements by each public authority in its own country, procurement initiated by one of the public authorities of the Group of Procurers in the name of others in the Group of Procurers.

At this stage of procuring the final commercial solution it is key that **Innovative Procurement** practices - such as the use of functional specifications - are applied to give new R&D pre-products/services equal chances in the commercial procurement process. Removing barriers that prevent procurers from retaining the more innovative proposals in a commercial tendering process are extremely important to ensure take-up of the new R&D products/services developed in the pre-commercial phase.

At the launch of the commercial procurement process it should be ensured that all bidders (including external suppliers X and suppliers A, B and D that participated in the pre-commercial procurement process but not up to the last phase 3) have equal opportunity and equal level of information to bid compared to the suppliers C and E that participated in all three pre-commercial procurement phases.

In what follows we concentrate on part B, the focus of our work, the Pre-commercial Procurement of Innovation phase.

### **3.3.3. A Shared Risk – Shared Benefit approach**

Where **regular procurement** is *the instrument* for "**Take No R&D Risk unless Collect All Benefits**" type of public purchases, **Pre-commercial Procurement of Innovation** is specifically tailored for a '**Shared R&D Risk - Shared R&D Benefit**' approach.

To share the risk of 'pulling' the new ICT technologies from the research phase to the first batch of non-commercial volume products, the Group of Procurers engages collectively in a "Pre-commercial Procurement of Innovation" process. R&D risks are mitigated on both sides by sharing risks and benefits between procurers (the Group of Procurers) and suppliers.

### **Shared R&D Risks**

#### *Risk-sharing between procurers and suppliers*

The pre-commercial phase gives the supplier an 'option' on full-scale commercialisation of his R&D efforts down the road. According to financial analysts<sup>93</sup> this 'option' has a value for the supplier which is a function of time, the upside commercialisation potential and the downside risk that the project will not be well received in the market. When making investment decisions (when suppliers compare different R&D projects to invest in) the value of this option determines the maximum amount of money that a company can spend on the pre-commercial R&D project. For projects targeted at private buyers the upside valorisation potential and downside risk are well balanced (probabilities are more or less equal). For projects targeted at the public sector however, risk aversion of public procurers limits<sup>94</sup> the upside valorisation potential (uncertainty in the operational cash flow the supplier can expect), and thus limits the supplier's option/prospects on full-scale diffusion and commercialisation, and thus limits his willingness to invest in public goods and services. The distortive effect between the balance of upside potential and downward risk for the suppliers is the greatest in direct public procurement<sup>95</sup> (procurement addressing needs *intrinsic* to the procuring organisation, e.g. e-government services), but is also present to a lesser extent in cooperative procurement (procurement based on *shared needs*, congeneric to multiple users, e.g. energy efficient lighting or buildings) and catalytic procurement (procurement based on needs *extrinsic* to the procuring organisation, needs of other users, e.g. new sustainable technologies). The only solution to resolve this deadlock situation is that **procurers** that have concrete yet-to-be-developed technology needs reach out to the **supply side to share the investment risk** of a well-defined pre-commercial R&D project (using public procurement instead of a subsidy instruments).

#### *Subsequent risks for the suppliers*

The risks for the suppliers are related to the fact that the value of the R&D 'option' is smaller when targeting a public sector customer than when targeting a private sector customer, and this while the R&D costs for the supplier are the same in both cases. The degree to which procurers share the R&D risks with suppliers may vary based upon the degree of distortion caused by the different types of public procurement<sup>95</sup> on the balance between the valorisation potential and downward risks for the suppliers. As contracts are awarded to suppliers on the basis of predefined fixed prices for the three phases, these fixed prices may not always cover all the costs actually incurred by the suppliers for delivering the requested R&D services. **Extra costs not covered by the fixed prices have to be born by the suppliers.** Especially in phase 1 and 2 the contract value will not cover the costs of building up the knowledge, experience and insight in the R&D domain, costs which the supplier incurred before the pre-commercial procurement process. In addition suppliers take the risk that after each phase, at each evaluation/selection point, the Group of Procurers can **stop the process or modify the R&D requirements for the next phase** based on the lessons learned in the previous phase. As the market potential behind the innovative technologies in the bidders' proposals is an important evaluation criterion in assessing the R&D risks and rewards of the pre-commercial procurement process, the suppliers also take the risk to **share with the Group of Procurers their business plans** for commercialising the new products and solutions being developed during the process.

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<sup>93</sup> Real Option Analysis is the financial theory referred to here.

"Hybrid real options valuation of risky product development projects", J.E. Neely, R de Neufville; Int. J. Technology, Policy and Management, Vol. 1, No.1, 2001

"Making Real Options Really Work", A.B. van Putten and Ian C. MacMillan; Harvard Business Review, december 2004, p 134

<sup>94</sup> "Real Options: a new financial instrument in the assessment of the potential of high risk innovation", presentation at Vlerick Ghent, Peter Thevissen, November 2004

<sup>95</sup> Professor Hommen (Sweden) distinguishes between: direct procurement (based on needs intrinsic to the procuring organisation, e.g. e-government services), cooperative procurement (based on shared needs, congeneric to multiple users e.g. energy efficient lighting or buildings), catalytic procurement (based on needs extrinsic to the procuring organisation, i.e. needs of other users e.g. new sustainable technologies)

### *Subsequent risks for the procurers*

Pooling public procurement resources together enables procurers in the Group to **share the risks** of procuring yet-to-be proven technology and to reduce R&D cost (larger volumes due to pooled demand). In concreto, risk sharing between the procurers in the Group translates itself into **sharing the price** of the R&D services performed by the suppliers (the predefined fixed prices for the three phases of the pre-commercial procurement process). Due to the natural risk-aversion in the purchasing behaviour of procurers, **risk-incentives** will be indispensable to turn public procurement into a strategic tool for procuring innovative ICT solutions on a big enough scale around Europe to break the economy of scale barriers. The Community may top up a risk-incentive to reward the risk-taking by Groups of Procurers engaging in this new type of procurement of not-yet-commercially proven technologies, especially for projects addressing an important problem of common European interest. Nothing prevents Member States from implementing in addition their own incentive schemes.

### **Shared R&D Benefits**

#### *Benefits for the procurers*

All public authorities participating in the Group of Procurers benefit equally from the shared vision which is built up during the pre-commercial procurement process regarding the potential of the newly developed technologies to address the problem of public interest. However, in contrast with regular commercial procurement practises in Europe, it is recommended that the contracting authority (the Group of Procurers) does NOT assume all the benefits of the pre-commercial R&D procurement.

This can be ensured by:

- Publishing widely the press announcement with the main outcomes of the project after completion of phase 3 of the pre-commercial procurement process
- Not assigning the IPRs 100% to the Group of Procurers (but e.g. 100% to the suppliers)
- Contributing to European standards bodies wherever R&D results are of European interest
- Allowing suppliers to commercialise new products/services resulting from the R&D independent from the Group of Procurers (e.g. by attracting external funding from VCs for full scale production)

The proposal is to apply the above actions both for direct, cooperative and catalytic public procurement<sup>95</sup>. For the last two types of procurement, it is clear that the procuring authority assumes even less direct benefits of the R&D. The most extreme cases where the public authority does not take all benefits of the R&D are the cases where the public authority financing the pre-commercial development is not the one finally buying and/or implementing the newly developed products/services. It may well be that it is another department than the one financing the pre-commercial R&D which ends up being the customer of the final product or service (e.g. department of public health financing a new water protection/inspection system which ends up being bought by the water utility companies). It may also be that the public authority financed the R&D of technologies that will never be bought by public authorities, but that nevertheless contribute to its policy goals (e.g. ministry of environment procuring cleaner exhaust filters to be bought, installed and commercialised by car manufacturers). In case the public authority *does* buy the final product of the R&D, the proposal is that the only real tangible benefit which the Group of Procurers requests from the suppliers is license-free use of the technologies and solutions protected by IPRs acquired during the pre-commercial procurement process.

#### *Benefits for the suppliers*

Suppliers benefit from the pre-commercial procurement process as it delivers them early feedback – right from the beginning of the R&D – from potential customers about the technological and commercial strong and weak points of their solution. The stepwise character of the pre-commercial process also allows the suppliers to adjust / fine-tune their development and business plans along the way step by step. Even suppliers that fall out the pre-commercial competitive process somewhere along the road, have gained important insight on the market potential and technology maturity of their ideas.

### **3.3.4. The participants**

Who can participate in the Pre-commercial Procurement of Innovation process? In order to create a programme with **equal competitive power** as similar pre-commercial procurement schemes in **the US** (e.g. DARPA/NASA and deduced programmes<sup>96</sup>), we propose that **contract bidders satisfy the following eligibility criteria** on the date of the contract award for phase 1, 2 and 3:

- for-profit organisation
- EEA based R&D centre of gravity
- principal researcher employed by proposing firm
- no double funding

The first three criteria are essential to ensure that sufficient knowledge and technologies developed in the course of the R&D work remain concentrated

(1) in the European Economic Area (to ensure coupling between supply and (public) demand side), and  
(2) in a firm (to ensure that there is enough ambition and potential to commercialise the products and services resulting from the R&D, thereby contributing to the creation of new lead markets for Europe).

*For profit* means that the main bidder submitting the offer has to be a firm, not a research institution (in case of a start-up SME, the SME has to be at the minimum registered as a company). With a firm is meant an enterprise in the legal form of an individual proprietorship, partnership, limited liability company, corporation, joint venture, association, trust or cooperative. The proposing firm is allowed to cooperate with or subcontract work to research institutions or other companies (even outside the EU) under the conditions that for:

- Phase 1: at least 2/3 of the research and/or analytical work is carried out by the proposing firm
- Phase 2: at least 1/2 of the research and/or analytical work is carried out by the proposing firm
- Phase 3: at least 1/2 of the R&D work is carried out by the proposing firm

The contract will be in the name of the main proposing firm. The proposing firm is required to specify in the offer all the parts of the contract that will be subcontracted and/or will be developed in cooperation with other partners. The proposing firm is encouraged to cooperate with European SMEs for the parts of the contracts that it does not intend to carry out itself.

*EEA based R&D centre of gravity* means that the part of the R&D work carried out by the main bidder (in case of zero subcontracting or zero cooperation with other partners this part equals 100%) has to be carried out in one or more of the main bidder's R&D centre(s) in the EEA. Proposing firms that do not have an R&D centre located in the EEA are not eligible. In contrast to similar pre-commercial procurement programmes in the US and some Asian countries, the working group does not recommend that the main bidder's operated principal place of business has to be located in the European Union, nor do we recommend a requirement of 51% European ownership of the proposing firm. As such conditions have had negative effect infringing competitive conditions, we recommend instead to award contracts only to proposing firms that are committed to locate the 'centre of gravity' of the relevant R&D as well as operational activities related to the contract in the EEA.

To guarantee that sufficient knowledge acquired in the course of the R&D work in the project remains in the bidding firm, *the principal researcher* responsible for, and/or carrying out, the main portion of the R&D work in the project has to be *employed by the main bidder's firm* for at least 50% of his time.

*Excluded* are project proposals that already receive another form of financial support / subsidy from one or more public authorities.

It should be understood that this is a proposal. Member States can develop other alternatives or variations on this proposal, although a common approach across Europe would be welcome.

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<sup>96</sup> SBIR = Small Business Innovation Research Programme (<http://www.sba.gov/sbir/>) is a 3 phase multi-competitor programme also based on DARPA/NASA multi stage multi-competitor R&D procurement programmes.

## **4. Candidate Areas of Public Interest**

The NAT IST RTD DIR Working Group on "Public Procurement in support of ICT Research and Innovation" has looked into a number of areas of public interest where public procurement could play a more strategic role to provide European lead markets for new ICT solutions. The Working Group fully recognises that successfully introducing public procurement as a demand driven measure to 'pull' new ICT R&D into commercial operation requires that public procurers themselves identify and formulate their new development needs for the coming years. Therefore, the candidate areas of potential interest highlighted below (more detail can be found in Annex II) should only be regarded as suggestions, as an input to stimulate discussion at the NAT IST RTD DIR Vienna Event. The following step would be to organise workshops bringing the procurers and other relevant stakeholders together.

A number of opportunities have been identified especially in the areas of Health, Inclusion, Government, Security and Transportation.

Opportunities in the **Health domain** cluster around the electronic patient summary record supported by smart electronic health cards, as well as e-prescription based on health information exchange networks. This will support mobility of citizens, enhance services to citizens, increase efficiency and improve patient safety. Health procurement is coordinated at different levels (national or regional/local level) in different Member States. Therefore Health procurement activities could build upon a range of existing vehicles such as the NETCARD initiative as well as the IHE (Integrating the Healthcare Enterprise) Initiative to setup an Interoperability e-Health demonstrator. Private-Public Partnerships (e.g. involving doctors, hospitals, care taking personnel, etc). The initiative of the Dutch Order for Medical Specialists on the electronic complication summary record, the European Health Insurance card and can be built upon as well.

In the **Inclusion domain** main areas are ambient assisted living (for elderly, children, etc), design for all workplaces, total conversation communication technologies, as well as multi-platform information society access / services in a convergent communication environment for groups at risk of exclusion e.g. in remote or deprived areas (mobile phone, DTV, PC and fixed/satellite/mobile). As inclusion procurement requirements necessitate strong political support, they need to be tabled at the national level. Public Procurement pilots in Ambient Assisted Living could build upon the existing AAL article 169<sup>97</sup> community. The other applications could be addressed via joint Member State calls.

Opportunities in the **Government domain** cluster around digital identities (relevant to e-procurement, virtual citizen / company dossier etc.), workflows for inter-administration business processes (distributed secure software tools) and interactive multi-channel multimedia government to consumer / business architectures. Though there is a lot of e-government activity at national level, there is still a lot of work to get regional and local authorities fully integrated. In addition there are specific applications and tools relevant to the regional and local level. Public Procurement activities in these areas can build upon the eGovernment subgroup ad hoc group on e-procurement, as well as interested communities from ongoing research projects.

Opportunities in the **Security domain** relate to border security, risk management systems (e.g. for large scale bioterrorism attacks, attacks on utility resources such as energy, water, etc) and automatic inspection in electronic customs/taxation systems (e.g. using RFID). Although specification setting may be coordinated at national and/or level, actual procurement may be delegated to the local level. There is interest from major water utility companies around Europe (e.g. Vitens NL) to extend their ongoing ICT technology procurement exploration exercises with new R&D and cooperate with other European partners.

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<sup>97</sup> Article 169 of the Treaty: "In implementing the multiannual framework programme, the Community may make provision, in agreement with the Member States concerned, for participation in research and development programmes undertaken by several Member States, including participation in the structures created for the execution of those programmes." For more info on the Article 169 initiative on Ambient Assisted Living refer to [www.aal169.org](http://www.aal169.org)

There are many opportunities in the **Infrastructure** domain. In the transportation sector there are traffic control systems for freight (for secure cargo tracking and managing freight movements) and passenger transport (integration of traffic control systems over different transport modes, communication between car and road infrastructure) as well as transport safety (advanced driver assistance systems ADAS, automatic emergency call from vehicles). Some areas require national and/or cross-national coordination (e.g. toll collection and railway signalling systems) where some others may perfectly be executed at regional and or local level (e.g. traffic congestion control systems). In addition collaboration with private partners (e.g. car manufacturers and ADAS mapping organisations) needs to be explored.

The proposal is that DG INFSO organises workshops on the different themes to reach out to the procurers and involve other relevant stakeholders.

The **Committee of the Regions** has offered to participate in organising the workshops reaching out to the regional and local authorities. The proposal is to start with three priority areas in the interest of **regional and local authorities: Government, Health and Transport**.

For the additional areas beyond the horizon of the regional and local authorities, the proposal is that the Commission will organise workshops starting with three domains. **National and Cross-National Transportation** includes ICT solutions for toll-collection and railway-signalling systems and could be tackled in cooperation between DG INFSO and DG TREN. **Security** including border security and large scale risk management systems could be tackled in cooperation between DG INFSO and DG ENTR. As a vehicle to get concrete **Ambient Assisted Living** pilot projects going, the existing Article 169 on AAL could be extended with a public procurement dimension.

## **5. Incentives**

The pressure on public procurers is to buy the most economically advantageous offers satisfying first of all their purchasing needs. They are increasingly aware of their obligations to implement their procurements in a fair, transparent and non-discriminatory manner according to the Public Procurement Directives. These two issues lead to a natural risk-aversion in the purchasing behaviour of procurers. Thus risk-incentives will be indispensable to turn public procurement into a strategic tool for procuring innovative ICT solutions on a big enough scale around Europe to break the economy of scale barriers. 'Pulling' new ICT products and services all the way from the research phase into commercial operation in a way which best suits common European interests, is a risk too great for public procurers to take on their own.

The new State Aid rules for R&D and Innovation allow Innovation Risk Incentives to be awarded for public authorities taking the risk of procuring not-yet-proven technologies. The incentives can be used along each of the three steps in Pre-commercial Procurement of Innovation. They can be used both at National and Community level. National Innovation Departments can use them to stimulate procuring departments to engage in pre-competitive R&D activities. The Community can use them to reward Groups of Procurers engaging in pre-commercial procurements tackling important problems of common European interest. This support can be based on Article 35 in the ICT Policy Support Programme of the CIP (Competitiveness and Innovation Programme): public procurement based on technical specifications elaborated in coordination with Member States.

FP7 coordination actions (e.g. 'ERA-NET' and 'Regions of Knowledge and ICT') can be used to support the formation of Groups of Procurers, networking and joint analysis of common issues related to public procurement in support of ICT research and innovation. In addition synergies between the 'Regions of Knowledge and ICT' FP funded coordination actions and the Structural Funds should be exploited as FP funded projects may qualify for an additional funding bonus from the Structural Funds.

There is nothing which prevents Member States from implementing their own incentive schemes but it is clear that a European dimension to Pre-commercial Procurement of Innovation is essential in strategic areas of common European interest and European Community risk-incentives are indispensable to make it happen.

<p>It is therefore proposed that the Community works out a concrete proposal for such support based on Article 35 of the CIP. Support from FP7 coordination or specific support action instruments should also be explored.</p>
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## **Annex I: Participants List**

The following people participated in the National IST Research Directors Forum Working Group that contributed to the report:

Chairman: Mr. Ulf Dahlsten, Director F - DG INFSO

Representatives from the Member States representing the National IST Research Directors Forum:

- Victor Izquierdo Loyola (Deputy Director General, Ministry of Industry-Tourism-Commerce, Spain)
- Doina Banciu (Director General, National Institute for R&D in Informatics, Romania)
- Eva Lindencrona (Director, Vinnova, Sweden)
- Leo Van de Loock & Peter Thevissen (Director Evaluation & Scientific Advisor, IWT, Belgium)
- Helmut Ennen (DLR, Germany)

External experts attending the Working Group as observers:

- Stephan Corvers (Founder Corvers Procurement Services, Netherlands)
- Kathrin Hornbanger (Founder Hornbanger Legal Services, former director legal service BBG, Austria)
- Mike Power (Category Manager for NHS IT and Telecommunications Department, UK)
- Hugo Lueders (Director Public Policy EMEA, CompTIA, Belgium)

Representatives from the EU Commission and Committee of the Regions Services attending the working group as observers:

- Aymard de Touzalin (Directorate F, DG INFSO)
- Robert Link (eGovernment unit, DG INFSO)
- Nick Batey, Immaculada Placencia Porrero & Wintlev-Jensen Peter (eInclusion unit, DG INFSO)
- Laura Pontiggia & Sion Claire (Lisbon Strategy and i2010 unit, DG INFSO)
- Myriam Coulon Cantuer (ICT for Transport unit, DG INFSO)
- Ragnar Bergstrom (ICT for Health unit, DG INFSO)
- Zoe Kay & Lieve Bos (Strategy for ICT Research unit, DG INFSO)
- David Osimo (IPTS, Joint Research Centre)
- Ronstrom Robert & Christof Kienel (Committee of the Regions)
- Tiscar Ramirez Jose (DG RTD)
- Ruben Schellingerhout (DG ENTR)
- Linda De Bie (DG MARKT)

## **Annex II: Candidate Areas of Public Interest (Detail)**

The following is a list of candidate areas of public interest identified by the Working Group as areas 'with potential' for public procurement in support of ICT Research and Innovation. The list identifies for each area the focus of the problem and the required ICT R&D to address it.

### **Inclusion Area**

#### **Inclusion 1**

- Focus: Services and products for Ambient Assisted Living, empowering people (elderly, people with complicated diseases e.g. diabetes, dementia, etc) to live independently by using assistive ICT technologies (in-house and/or on the move).
- R&D: (bio)sensors, assistive technologies, wearable, implantable or portable mobile health systems, in-vitro point-of-care diagnostic devices, intelligent tele-control systems, barrier-free design for all design technology development methodologies

#### **Inclusion 2**

- Focus: Mainstream ICT technology, computers, printers, telecomm equipment used in offices and in general in the workplace that need to be made more accessible, usable and inclusive for integrating groups with high unemployment rate back into the market (e.g. people with disabilities, cultural minorities and older people near retirement age extending working life)
- R&D: assistive technologies, flexible user interfaces, control systems, design for all ICT and design for all methodologies and tools

#### **Inclusion 3**

- Focus: Mainstream Communication technologies including networks and terminals enabling total conversation (real time text communication combined with video and voice). This is particularly important to permit access to people with disabilities and older persons in particular to those that are hard of hearing or deaf to emergency services (e.g. 112 number).
- R&D: assistive technologies, flexible user interfaces, control systems, design for all ICT and design for all methodologies and tools

### **Health Area**

#### **Health 1**

- Focus: Smart electronic health cards, stepwise extending the electronic European Health Insurance card to include emergency health data, electronic patient summary and health record
- R&D: solve today's incompleteness/absence of generally accepted standards, achieve semantic interoperability, interoperable and coherent European wide privacy, security/privacy and data sharing architecture, foster integration between databases and clinical documents

#### **Health 2**

- Focus: Health Information Exchange Networks (interconnecting hospitals, pharmacy, doctors, home care companies, insurance companies etc) and Services (e.g. e-referral, e-prescription)
- R&D: standards for secure, authenticated, privacy protected data exchange, semantic interoperability of medical terms

#### **Health 4**

- Focus: Utility companies consumer safety (e.g. protection of health level of water)
- R&D: To solve today's lack of interoperability between ICT systems and process automation systems in the water sector. This includes better general acceptance of standards (at technical and semantic levels) as well as their further development for instance addressing security issues.

### **Government Area**

#### **Government 1**

- Focus: Extend today's embryonic e-procurement architecture (currently focusing on e-archiving core part) to cover all stages electronically: notification, publication, submission, archiving, evaluation/awarding, ordering, invoicing.

- **R&D:** develop an interoperable architecture for the missing core e-procurement building blocks. Enable cross border e-Procurement; virtual company dossier, registration of companies (research project); Digital ID (extension of e-ID), e-authentication, e-signature, etc. Beyond security and privacy, this incorporates also developing a full model of different societal roles and associated rights/data in which individuals and businesses interact with the government; new services (cross-border business registration and information about businesses)

#### **Government 2**

- **Focus:** e-Customs/Taxation, automating and simplifying tax and customs declarations and on-line real-time back-office processing in ports, airports etc.
- **R&D:** Besides the straightforward informatisation and automation of existing processes (single window customs), new evolutions are automatic inspection (scanning of RFID tagged containers to identify the nature of the content) and the huge data processing behind that. Interoperability across member states will also require standardisation effort in this area.

#### **Government 3**

- **Focus:** Interactive multi-channel Government-to-Consumer/Business architectures, which make use of multiple channels (mobile, fixed telephony, digital TV, Internet,...) and languages to deliver truly citizen-centred, inclusive public services
- **R&D:** intelligent information repurposing, use of multiple different channels within workflows or transactions, use of fixed and mobile VoIP, semantic representation of government processes

#### **Government 4**

- **Focus:** Government Multimedia Content. Public authorities are big content procurers (education, health, etc). With the multi-channel interactive architectures and the communications sector (GtoG, GtoC, GtoB) going multimedia, governments will need even bigger volumes and more different types of content formats.
- **R&D:** A common set of specifications across Europe related to digital content (e.g. exchange formats) may be a very valuable asset for e-Gov service interoperability reasons (mobility of people cross Europe, cross boundary interactions between public authorities, etc)

#### **Government 5**

- **Focus:** Distributed secure workflow for inter-administration business processes (Software tools + method)
- **R&D:** New tools and methods for interoperable business workflows

### **Security Area**

#### **Security 1**

- **Focus:** Border security (person identification via video cameras, biometrics, sensors etc)
- **R&D:** intelligent combination of different data sources, real-time matching with police data, huge data processing

#### **Security 2**

- **Focus:** Risk Management of large scale events (e.g. Health pandemics, bio-terrorism attacks)
- **R&D:** sensor networks, intelligent combination of various types of inputs from multiple sources, cartographic mapping/visualisation of the affected areas/groups of population, decision support systems

### **Transportation Area**

#### **Transportation 1**

- **Focus:** Traffic Control Systems, to manage freight transport in conurbations and along complex supply chains including modal shifts for the sake of efficiency, environmental friendliness, competitiveness and tracking cargo for security of supplies
- **R&D:** Decision support systems to enhance planning and executing transport logistics processes, integrating satellite navigation, RFID technologies and Smart Tags

#### **Transportation 2**

- **Focus:** Integrated Traffic Information Systems, across various transport modes

- R&D: integrating real-time railway, waterway, airport, highway etc traffic information (standards issues) and use this for forecasting (what's best transport means to take from A to B), traffic control/increased safety (police)

### **Transportation 3**

- Focus: Upgrading of Public Safety Answering Points and telecom operators signalling network to handle E112 and eCall (automatic vehicle triggered emergency call in case of accident)
- R&D: MSD (Minimum Set of Data) standardisation and certification, PSAP software, mobile network operators software

### **Transportation 4**

- Focus: Traffic Management solutions to improve the efficiency of the road network, reduce congestion and increase safety
- R&D: V2V, V2I and I2I Communications (V=Vehicle, I=Infrastructure), Traffic Management Centres, road side equipment

### **Transportation 5**

- Focus: To create more reliable and up to date digital map database for in-car advanced driver assistance systems by including safety attributes (e.g. speed limit, traffic signs, right of way). These safety attributes could be provided by public authorities to mapping companies.
- R&D: to develop updating mechanisms and quality assurance, and to define and agree on the format of information exchange on European level