



European
Commission

European Public Sector **Innovation** Scoreboard 2013

A pilot exercise

Enterprise
and Industry



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Acknowledgments:

The authors are grateful to the participants of the expert workshop (Brussels, May 2012) for their valuable inputs.

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More information on the European Union is available on the Internet (<http://europa.eu>)

Cataloguing data can be found at the end of this publication.

Cover picture: iStock_000005941755Large©mevans

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Printed in Belgium

PRINTED ON CHLORINE FREE PAPER

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- A pilot exercise -



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Executive summary

Public sector and its key economic role

The public sector plays a key economic role as regulator, service provider and employer. It accounts for more than 25% of total employment and a significant share of economic activity in the EU27 Member States. Additionally, an efficient and productive public sector can be a strong driver of economic growth through its support for and governance of the private sector.

European governments are acknowledging more and more the importance of public sector innovation. There is a consensus across countries and public administrations as to what is meant by public sector innovation: innovation is seen as a means to address growing budgetary pressures, through more efficient administration or service delivery, and new societal demands, through different and more effective service design. Due to the economic crisis and severe budget cuts, public sector innovation remains a challenge but also a solution.

Historically, the public sector has developed differently from the private sector, where efficiency and innovation have always been critical to sustained success. For much of the post-war era, the public sector has enjoyed a rather more benevolent existence. Financial austerity is changing the rules of the game for the public sector, and today public-sector efficiency and performance are central to governmental efforts throughout Europe to address deep budgetary constraints. Tight finances and societal pressures are the twin drivers of the almost universal search for better and cheaper public services. This holds for services provided to citizens and for those delivered to business. In some respects, the imperative to innovate is even greater now for the public sector than it is for the private sector.

Need for better measuring public sector innovation in Europe

Following the Europe 2020 Innovation Union flagship initiative, the European Commission launched a pilot European Public Sector Innovation Scoreboard (EPSIS) with a view to improving our ability to benchmark our performance. The ultimate ambition is to capture and present public sector innovation in a similar way to countries' innovation performance in the Innovation Union Scoreboard (IUS) and thereby encourage and

facilitate innovation activity across the public sector. The 2013 pilot EPSIS is the first EU wide attempt to better understand and to analyse innovation in the public sector. It was developed based on the experience of earlier national and regional projects, tested widely and discussed with a number of key relevant experts.

While there is a long-standing tradition in collecting innovation data for the business sector, such data is only sporadically collected for the public sector. In order to obtain more information – and to feed this pilot report – two special Innobarometer surveys were launched in 2010-2012 to obtain information on how public sector innovates and what is the impact of its innovation activities on business performance. Despite the usefulness of the information obtained, they provide a snapshot view only. Thus, the current EPSIS is an exploratory analysis, based on limited available information including the unique data obtained by the two surveys. The value of the scoreboard to policy makers and other interested stakeholders could certainly be improved if data was to be collected on a regular basis.

Piloting European Public Sector Innovation Scoreboard

Based on available data, the pilot EPSIS distinguishes seven innovation dimensions ranging from human resources to drivers and barriers to innovation. It uses a measurement framework similar to that used for the Innovation Union Scoreboard (IUS). The seven dimensions encompass 22 indicators, with data taken from multiple sources including Eurostat, OECD, World Bank, World Economic Forum and the 2010 and 2011 Innobarometer surveys.

The general results demonstrate that public sector in Europe innovates but it faces a number of challenges. The first results show that the involvement of managers and employees makes it more likely that a public administration develops process innovations. The presence of internal barriers to innovation (e.g. lack of management support, staff resistance or risk-averse culture) not only has a negative effect on innovation but also on the government's effectiveness in general. Government procurement can not only act as a driver of business performance by demanding innovative solutions, but procurement of innovations

can also contribute to an increased efficiency of the government sector. However, there is a clear divide in the opinion of public administration officials and businesses as to the importance of innovation versus costs for winning procurement tenders with business having a much firmer belief in offering low costs. The results also show that the introduction of new and improved public services have a significant impact on business performance. E.g. by investing in advanced ICT infrastructure, governments have managed to considerably increase the online availability of public services for businesses.

Public sector is already innovating

The Innobarometer 2010 on innovation in public administrations shows that public administration is highly innovative with two out of three public administration organisations having introduced at least one service innovation. Most drivers are 'structural' with the single most important driver being the introduction of new laws and regulations. Barriers to innovation are probably as important as drivers: lack of human or financial resources, regulatory requirements and lack of management support and incentives for staff are the most important barriers to innovation in public administration. Ideas from staff, management and clients are the major sources of information used in developing innovations. Innovation in public administration has positive effects on improved user access to information, improved user satisfaction and faster delivery of services.

Innovative public services drive business performance and growth

Results of the Innobarometer 2011 show the importance of public sector innovation for business performance. For example, companies that report benefits from using improved public administration procedures (e.g. online completion of government forms or access to online information on government services) are more likely to be an innovator and to have increasing sales. Public services innovations have a positive impact on the probability that a company will innovate. The results also confirm that government procurement has a positive impact on the probability that a company will innovate. These results suggest that in countries where governments

manage to provide improved public services for innovation and create a more business-friendly environment, companies show improved economic and innovative performance. Innovative and high quality public services act as a driver of business performance.

Need for more and better data

The pilot EPSIS does not provide a ranking of countries' performance, since the availability of data is still limited and does not fully capture all parts of the public sector or all aspects of innovation. However, it is sufficient to give a sense of the strengths and weaknesses across countries. In many countries, services of public sector are being delivered by many different types of organisations, and not just public administrations.

The feedback from public officials consulted as part of the "Trends and Challenges in Public Sector Innovation in Europe" study confirms that further efforts to develop the measurement and benchmarking of public sector innovation would be of interest to most if not all Member States and that this is an area where European policy should continue to show leadership.

Thus, further work is needed to capture the full spectrum of innovation in public sector. Very much more and better data is needed if EPSIS is going to continue and attain the coverage and robustness achieved with IUS. For this purpose, strong and coordinated efforts at the European and Member States level are needed.

1. Introduction

This report presents an account of a pilot exercise to construct an EU-wide metrics system measuring and comparing the performance and impact of public sector innovation in Europe.

Without doubt, the public sector plays a key economic role as regulator, service provider and employer and accounts for a significant share of economic activity in the developed countries. There are many roles and functions of the public sector such as to develop and maintain trust in government, create rules and law, ensure social security, create favourable institutional framework conditions, provide quality services and to respond to the needs of citizens and businesses at European, national, regional and local level.

The significance of the public sector is only partly about scale. In the majority of EU member states, the public sector accounts for more than 25% of total employment. The critical issues for business are qualitative.

The quality and innovativeness of public institutions across Europe has a bearing on competitiveness and growth. The overall consistency and efficiency of the operation of public services, legal systems and framework conditions for business are of key importance, both in a positive and a negative sense. On a positive note, good government can address market failures that would otherwise inhibit the emergence of new industries or the equitable provision of societal services. On the negative side, excessive bureaucracy and overregulation imposes significant and unnecessary costs on business and citizens, and may even slow the process of economic development. In addition, the proper management of public finances is also critical to ensuring trust in the national business environment.

While the current economic crisis has underlined the need for making efficiency gains, improving governance and increasing user involvement in conditioning the work of the public sector, industry is rather more concerned with matters such as macroeconomic stability, business support measures and smart regulation.

The public sector however has developed markedly different from the private sector, where efficiency and innovation are key for economic success. For decades, the public sector – in particular public administration – has enjoyed a rather inconspicuous existence. Current budgetary constraints and societal pressures however are drivers of the plea for efficiency gains, better governance and more user involvement. In this respect, the modernisation and innovation in public sector are of growing public interest. **The public sector is a key player to develop measures to ensure financial stability and fiscal consolidation, as well as actions to foster growth, competitiveness and employment.**

Following the Europe 2020 Innovation Union flagship initiative (commitment 27), and other preparatory works in 2009-2010, the European Commission has been piloting the European Public Sector Innovation Scoreboard (EPSIS) as a basis for further work to benchmark public sector innovation.

The very great majority of European governments acknowledge the importance of public sector innovation, as a means by which to help cope with current austerity measures on the one hand and, for the longer term, to better address globalisation and grand societal challenges on the other. However, it is a phenomenon that is somewhat under-researched and perhaps even more critically poorly documented. There have been various notable recent initiatives in Europe and outside that have sought to advance our understanding of these matters and also test data collection tools, whether that is the “Measuring Public Innovation in the Nordic countries” (MEPIN) project in Scandinavia or the UK government’s creation of a national Public Sector Innovation Index (NESTA, 2010).

The pilot European Public Sector Innovation Scoreboard is the first EU wide attempt to better understand and analyse the innovation in public sector. It has been developed based on the experience of those earlier national and regional projects, but also in close discussion with a number of European stakeholders from academia and public sector. The EPSIS proposals have also been

tested more widely and evolved through several iterations, beginning with a round of discussions with representatives of national ministries¹, and then a more deliberative and critical review of an advanced draft through an expert workshop that was held in Brussels in May 2012². The work on EPSIS will continue.

These national and regional experiments have all struggled with the paucity of data available and this universal deficit has also been a feature of the current pilot exercise. The need for more and better data was anticipated however and part of our work on EPSIS has been to specify those data requirements in more detail and to outline European and Member States' options for developing the necessary data streams going forward. Notwithstanding these recommendations, it is fair to say that the credibility and utility of EPSIS is critically dependent upon the willingness of all public institutions to devote substantially more time and energy to the recording and reporting of their activities. In short, **Europe needs more and better data on public sector innovation** in order to help translate policy ambition into wide-ranging innovations on the ground.

In order to obtain more information two special Innobarometer surveys were launched³. Despite the usefulness of the information obtained, they provide a snapshot view only and are not replicated on a regular basis. In order to obtain more insights and to monitor the innovation performance of the public sector, it is necessary to agree on a limited number of key indicators and start collecting them in the EU Member States. The current scoreboard is thus a rather exploratory analysis, based on limited available information plus the information obtained via the Innobarometer studies. The value of the scoreboard to policy makers and other interested stakeholders could certainly be improved if data was to be collected on a regular basis. Copying an instrument such as the Community Innovation Survey, which provides us with ample insights on the innovation behaviour in the private sector and as a survey is adopted around the world, may be one example of how to obtain important insights on public sector innovation by changing the addressees.

The remainder of this report is structured as follows. Section 2 briefly discusses how the public sector and public sector innovation are defined, which sets out the common ground used throughout the report and the Scoreboard. Section 3 provides a brief literature review on public sector innovation in scientific publications and studies measuring innovation in the public sector, which should help readers to follow the evolution in the state of the art and also to grasp several remaining unanswered questions and methodological challenges. Section 4 provides the conceptual framework and indicators used for the EPSIS 2013. Section 5 discusses the results by indicator and presents the EPSIS scorecard and country profiles. Section 6 discusses the results of the EU-wide survey on firms' perceptions of the importance of innovative public services for business performance and competitiveness, demonstrating the importance of public sector innovation. Section 7 will conclude.

¹ Enterprise Policy Group, Working group on innovation (Decision 2000/690/EC)

² The workshop programme and key experts are shown in the appendices to this report in Annex 2.

³ European Commission (2011) "Innobarometer 2010: Innovation in Public Administration" (Flash Eurobarometer 305) and European Commission (2012), "Innobarometer 2011: Innovation in the public sector, its perception in and impact on business", (Flash Eurobarometer 343).

2. Defining innovation in the public sector

Defining the public sector

The work on public sector innovation in academic as well as international organisations has shown that common definitions may need to be altered. There is a rather unambiguous definition about the public sector. According to the OECD's Glossary of statistical terms, *"The public sector comprises the general government sector plus all public corporations including the central bank"* (OECD 2001). According to the Frascati manual (OECD 2002), the "government sector" basically covers two entities:

- *All departments, offices and other bodies which furnish, but normally do not sell to the community, those common services, other than higher education, which cannot otherwise be conveniently and economically provided, as well as those that administer the state and the economic and social policy of the community. (Public enterprises are included in the business enterprise sector.);*
- *NPIs [non-profit institutions] controlled and mainly financed by government, but not administered by the higher education sector.*

The Manual further provides the scope of the definition:

"(...) this sector should include all bodies, departments and establishments of government – central, state or provincial, district or county, municipal, town or village – that engage in a wide range of activities, such as: administration; defence and regulation of public order; health, education, cultural, recreational, and other social services; promotion of economic growth and welfare; and technological development. The legislature, the executive, departments, establishments and other bodies of government should be included, irrespective of their treatment in government accounts. Government-administered social security funds are also included" (OECD 2002, p.63).

In order to group and measure the activities of the 'government sector', the United Nations' COFOG classification (Classification of the Functions of Government), is used. The ten divisions (Table 1) and 69 groups as well as an even larger number of classes provide a detailed functional breakdown with however no concordance to R&D activities.

Table 1: COFOG classification, 1-digit level (UN)

01 - General public services	06 - Housing and community amenities
02 - Defence	07 - Health
03 - Public order and safety	08 - Recreation, culture and religion
04 - Economic affairs	09 - Education
05 - Environmental protection	10 - Social protection

Defining innovation

The Oslo Manual defines an innovation as "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations." This definition clearly reflects innovation in the private sector, but it does not reflect innovation in the public sector.

Windrum (2008) suggested a taxonomy of public sector innovation comprising:

- service innovation (the introduction of a new service or an improvement to the quality of an existing service);
- service delivery innovation (new or altered ways of supplying public services);
- administrative and organisational innovation (changes in organisational structures and routines);

- conceptual innovation (the development of new views and challenge existing assumptions);
 - policy innovation (changes to thinking or behavioural intentions); and
 - systemic innovation (new or improved ways of interacting with other organisations and sources of knowledge).
- The first three types of innovation are similar in the private sector, but the four latter ones address the public sector. This conceptual widening can also be found in the definition used within the MEPIN project, and which was then used in the Innobarometer 2010. Here in this more formal definition, process and organisational innovation remain basically the same for the private and the public sector, but product innovation is replaced by service innovation, and marketing is replaced by communication innovation:
- “A *product innovation* is the introduction of a service or good that is new or significantly improved compared to existing services or goods in your organisation. This includes significant improvements in the service or good's characteristics, in customer access or in how it is used.
 - A *communication innovation* is the implementation of a new method of promoting the organisation or its services and goods, or new methods to influence the behaviour of individuals or others. These must differ significantly from existing communication methods in your organisation.”

There are thus differences in the types of innovation in the private and public sector (Table 2) where communication innovations in the public sector replace marketing innovations in the private sector.

Table 2: Differences between private and public sector innovation

Private sector	Public sector
• product innovation	• service innovation
• process innovation	• process innovation
• organisational innovation	• organisational innovation
• marketing innovation	• communication innovation

Defining public sector innovation

For EPSIS the definition of public sector innovation follows that used in the Innobarometer 2010 (EC, 2010): *An innovation is a new or significantly improved service, communication method, process or organisational method.*

New or significantly improved methods of communicating activities to the public include: new or improved methods of promoting an organisation or its services; new or improved methods of influencing the behaviour of users, citizens or others; or first time commercialisation (for sale) of services or goods.

New or significantly improved processes or organisational methods include: new or improved methods of providing services or interacting with users; new or improved delivery or logistics systems for an organisation's inputs; new or improved supporting activities such as maintenance systems, purchasing, accounting or

computing systems; new or improved management systems; or new or improved methods of organising work responsibilities or decision making.

Economic importance of the public sector and public administration

In all economically developed countries, the public sector contributes to a substantial share of national GDP. Efforts to improve innovation in the public sector are expected to have a notable effect on public benefits such as improved productivity (and hence higher living standards), efficiency of service delivery, and quality of public services. In addition to the effectiveness of innovation in the public sector, the size of the potential benefits depends on the contribution of the public sector to GDP. This is difficult to estimate precisely, in part because of differences in how the public sector is defined and the use of different methods to measure the economic contribution of the public sector.

Table 3: Share of public sector (% of GDP)

	General government	Consumption expenditure	Gross fixed capital formation	Total tax revenue
	2011	2011	2011	2010
Belgium	26.1	24.4	1.7	46.3
Bulgaria	18.9	15.5	3.4	27.5
Czech Republic	24.2	20.6	3.6	33.5
Denmark	30.6	28.4	2.2	48.5
Germany	20.9	19.3	1.6	39.5
Estonia	23.7	19.5	4.2	34.3
Ireland	20.9	18.4	2.5	29.8
Greece	19.0	17.4	1.6	33.2
Spain	23.8	20.9	2.9	32.9
France	27.6	24.5	3.1	44.5
Italy	22.5	20.5	2.0	42.6
Cyprus	23.6	20.1	3.5	35.7
Latvia	20.3	16.1	4.2	27.5
Lithuania	23.3	18.9	4.4	27.4
Luxembourg	20.2	16.4	3.8	38.0
Hungary	23.8	20.8	3.0	37.8
Malta	23.2	20.7	2.5	34.4
Netherlands	31.3	27.9	3.4	39.5
Austria	19.8	18.8	1.0	43.7
Poland	23.7	18.0	5.7	31.8
Portugal	22.7	20.1	2.6	34.8
Romania	19.6	14.4	5.2	27.6
Slovenia	24.4	20.8	3.6	38.1
Slovakia	20.3	18.0	2.3	28.3
Finland	26.8	24.3	2.5	42.6
Sweden	29.8	26.4	3.4	46.3
United Kingdom	24.4	22.2	2.2	37.4
Iceland	27.1	25.3	1.8	35.0
Norway	24.7	21.5	3.2	42.9
Switzerland	13.4	11.1	2.3	28.0

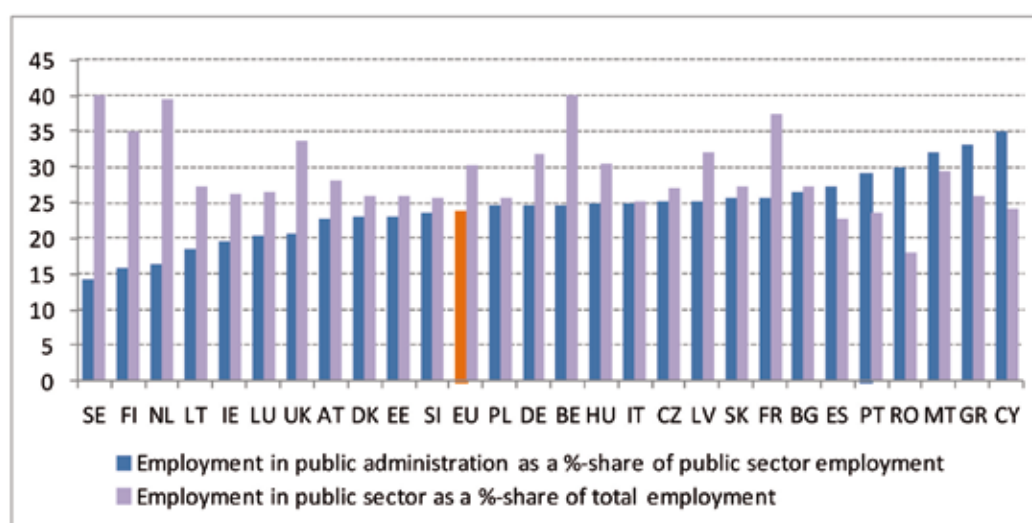
The data are from Eurostat online tables for 'final consumption expenditures of general government at current prices' (<http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tec00010&plugin=1>), and 'General government gross fixed capital formation for EU-27' (<http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tec00022&plugin=1>). Site last accessed on 12 November 2012.

The method of measuring the economic impact of the public sector has a notable effect on estimates of the economic importance of the public sector. The highest estimates of the public sector share of up to 50% or 55% of GDP, widely reported in popular magazines and newspapers, are due to confusing tax revenues with GDP. In 2010, the tax revenue share of GDP in Belgium, Denmark and Sweden was between 45% and 50%⁴. Tax revenue is a poor measure of the economic impact of the public sector because a sizable fraction of these revenues is spent on transfer payments to individuals for pensions and welfare payments or to private businesses as various forms of subsidies. Based on OECD definitions, the public sector share of GDP equals final general government consumption expenditures and gross

capital formation by the general government (all government levels combined). This method estimates that the GDP share of the Danish public sector in 2011 was 30.6%, well below the tax revenue share of 48.5% for 2010 (Table 3).

According to Bauby and Similie (2010), public administration activities account for approximately 25% of all public sector activities with highest shares of 30% or more in Cyprus, Greece and Malta and lowest shares around 15% in Finland, Netherlands and Sweden (Figure 1) whereas the total public sector is largest in terms of employment in Belgium, Netherlands and Sweden accounting for almost 40% of total employment.

Figure 1: Employment in public administration as a share of public sector employment



Source: Bauby and Similie (2010)

⁴ http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Tax_revenue_statistics

3. Public sector innovation: Growing attention and various insights

Growing attention

Despite the growing interest in public sector innovation, the collected insights are basically drawn from a number of individual cases studies which vary according to object, location, as well as research question. However, the body of case studies provides numerous insights which add solving the public sector innovation 'myth'.

Relevant research from a management or entrepreneurial perspective on innovation by public administration agencies was published in the 1960s⁵ but Roessner's 1977 study *'Incentives to innovate in public and private organizations'* is the first study to directly examine innovation in the public sector. Until the early 2000s, most research on public sector innovation was by academics in the fields of management and entrepreneurship and appears to have been dominated by case studies focusing on comparing the organizational characteristics of the public and private sector. A review of 30 studies on the organizational differences between public and private sector organizations by Perry and Rainey (1988) showed that public sector organizations have more formal organizational structures and are more open to external pressure, but public managers have less autonomy and are less likely to introduce changes to promote efficiency.

However, there has been little evidence to support the common belief that public sector organizations are less innovative than private businesses. Earl (2004) found little difference in the adoption rate for innovative business practices between public organizations and private firms with over 500 full-time employees in Canada. According to the Innobarometer 2010 survey out of the approximately 4,000 European organizations in public administration surveyed, 90% had introduced an innovation over a two year period – a percentage considerably higher than the 50% share of innovative companies in the private sector over a three year period (Eurostat, 2010).⁶

A lack of innovation can be seen as a driving hypothesis of the management research in the 1980s and 1990s which focused on the adoption of New Public Management (NPM). Under the NPM reform, changes of the public sector included the introduction of market-based mechanisms such as performance

measurement tools and innovativeness. The reforms aimed at introducing successful management techniques into old-style bureaucracies and to embrace a service-oriented working-style (Vigoda-Gadot et al., 2008). This strand of research defines the "public sector" basically as a service provider, beneficiaries being customers who can be individuals as well as firms. NPM was viewed as a solution to a perceived innovation lack in the public sector, due in part to risk-aversion and an innovation-unfriendly public sector culture (Windrum, 2008).

Various insights

From the 'traditional' view, innovation in the public sector results from a **'top down' approach** basically from high level policy decisions at the ministerial or political level and being implemented through the actions of senior management (Hartley, 2005). This view was already challenged by Borins (2000, 2001) showing that the majority of innovations were initiated by middle management and front line staff, thus providing support for a **'bottom up' approach**. More research confirms that innovative ideas come from both sides. The source of the idea however does influence the type of innovation: ideas initiated by middle management and front-line staff are more likely to generate incremental innovations while ideas initiated by top-level management are more likely to generate larger-scale innovations (Borins, 2010; Fuglsang, 2010; Hughes et al., 2010). A possible explanation is that bottom-up innovations are created to solve problems in specific locations and are thus less likely to diffuse (Thenint, 2010). The further distinction between 'bottom up' and 'top down' was provided by Thenint (2010) introducing **policy driven innovations** that are top down innovations driven by political or ministerial decisions (Mulgan and Albury, 2003).

Good management and leadership can play an important role in public sector innovation. Walker (2006), in a study of 120 local authorities in the United Kingdom found that political leadership can encourage the adoption of innovative services. According to the MEPIN study (Bugge et al., 2011) addressing the Nordic countries, internal management was the most important driver of innovation, but public sector innovation happens

⁵ See Windrum (2008) for a review of some of these earlier studies.

⁶ http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/9-10112010-AP/EN/9-10112010-AP-EN.PDF

more likely when it is supported by the senior management.

Public sector organizations may need to draw on a wide range of **information sources** in order to successfully develop and implement an innovation. Relevant information can be obtained from sources within the public organization and from external sources. The Innobarometer 2010 showed that ideas from internal management and staff are very important information sources for almost half of European public administration organisations. From the external sources, citizens are also important whereas enterprises on the other hand – as suppliers, clients, or users – are only very important for less than 20% of European public administration organisations. Using information from external sources may also require **collaboration** with external sources. The Innobarometer 2010 reported that over 80% of public sector organizations collaborate on service innovations. This is again significantly higher than for the private sector where about one-third of innovative enterprises collaborate with external partners (Eurostat, 2010).

Drivers of public sector innovation can be internal or through external pressure. According to Borins (1998) internal problems within an agency or department are the most frequent drivers for innovation. Borins equally pointed out that human resources themselves are internal drivers: in the public as well as in the private sector middle-management and front-line levels contain many younger, often recent university graduates who are close to day-to-day operations as well as close to cutting-edge thinking they encountered recently at universities (Borins, 2001). They are thus more likely to be open to innovation and have a clear understanding of technical requirements and processes. External drivers such as regulation impose organisations to innovate – whether they want it or not. The Innobarometer 2010 confirms that most drivers are ‘structural’ with the single most important driver being the introduction of new laws and regulations (a very important driver for almost half of the public administration organisations).

Barriers to innovation are probably as important as the drivers: similar to private enterprises, the ‘lack

of human or financial resources’ is the most important barrier to innovation in public administration, followed by ‘regulatory requirements’, ‘lack of management support’ and ‘lack of incentives for staff’. The MEPIN study (Bugge et al., 2011) similarly found a ‘lack of funding’ and ‘inadequate time’ to be the most frequently mentioned barriers to innovation.

Empirical research to date provides little information on the **outcomes or effects of public sector innovation**. Hughes et al. (2011) found that over 80% of respondents reported improvements in efficiency, quality, and access to services. According to the Innobarometer 2010, 76% of respondents in public administration report that service innovations improved user access, 71% increased user satisfaction, and 61% find that process innovation resulted in faster delivery of services.

Through a **public procurement**, the public sector can induce two effects on innovation, one on the innovation performance of private firms and one on the services offered by the public sector itself. Due to the size of public procurement markets this instrument obtains a growing interest from policy-makers that see a huge potential of procurement as an underdeveloped demand-side policy and potential large driver for innovation. Indeed, by asking for creative solutions, public procurement can act as a driver of private sector innovation. Edler and Georghiou (2007) identified different forms of procurement and the roles of innovation therein: in *general procurement* innovation is an essential criterion in both the tender specifications and the assessment of proposals. In *strategic procurement* the demand for new technologies, goods or services is being encouraged. A study by Aschhoff and Sofka (2009) based on German innovation survey data showed that firms having won procurement contracts had higher sales shares for innovative products than firms that did not have such contracts. According to the earlier Innobarometer 2009 survey of more than 5,000 European firms (European Commission, 2009) out of those firms that had won a tender, a third stated that the tender provided an opportunity to offer innovative goods or services.

The Innobarometer 2010 is one of the few studies looking at the effect of public procurement on the

cost or quality of public services itself. Interesting to note, for public administration organisations with at least one published tender, 63% reported that cost and innovative characteristics were of equal importance, while low cost was more important for 20%, and innovation was more important for 11%. This does show a tendency to look at the cost and less on the innovation potential of procurements. In terms of effects, over half of the respondents (55%) stated that tenders resulted in new or improved services provided by their organisation, 44% that they reduced costs for providing services, and 38% stated that they reduced the environmental impacts of their services. The results also indicate a link between the different preferences either for innovation or low cost. In tenders where innovation is more important than low cost, higher shares of new services (68%) and reduced cost of services (46%) were realised than for tenders where low cost was more important than the innovation aspect (49% and 40% respectively).

From idiosyncratic insights to measuring innovation in the public sector

Since the 1990s, the number of research articles on public sector innovation has grown gradually; most of the research is using case studies. Research using **survey-based approaches** to examine public sector innovation over a large number of organisations, is a rather recent undertaking. Their advantage is the capturing of a greater diversity of approaches to innovation and they can provide indicators on innovation activities at specific points in time. The disadvantage of survey-based approaches is high costs limiting more frequent undertakings.

Arundel (2012, forthcoming) identified 17 studies using 15 large scale datasets to evaluate public sector innovation in developed economies distinguishing between using three research methods: 1) An object-based method examining specific innovations (the object), 2) Business practice surveys asking public sector managers about their use of specific innovative business practices and technologies, and 3) Innovation surveys asking about a range of innovation activities and types of innovations implemented over a defined time period.

Over time, the focus has shifted from the first two approaches to the use of innovation surveys (e.g. APSC, 2011; Arundel and Hollanders, 2011; Audit Commission, 2007, Bugge et al., 2011; European Commission, 2011, Hughes et al., 2011, and Laegreid et al., 2011) collecting data on a wider range of data than object-based and business practice surveys with a greater interest in external information sources, incentives, sources of innovative ideas, and outcomes.

Important insights from recent surveys can be generated from the three individual surveys of public sector innovation:

- The **NESTA** pilot survey of health organisations and local government organisations in the UK, which obtained 175 responses (Hughes et al., 2011);
- The **MEPIN** project implemented in the Nordic countries of Denmark, Finland, Iceland, Norway, and Sweden. The type of public agency surveyed varied in each country. Responses were obtained from 2,012 public sector organisations;
- The European Commission's **Innobarometer** 2010. The survey, including all 27 European Union countries plus Norway and Switzerland, was limited to organisations active in public administration and obtained 3,699 responses.

The questionnaires of the three above mentioned surveys use a similar definition of innovation in the public sector and collect data on innovation activities and management strategies, but there are also notable differences. The major difference between the MEPIN and the IB questionnaire is the former's more closely tracking of the Community Innovation Survey for private firms, and limiting information on outcomes: one question asks if the organisation was the first to develop any of its product innovations and a second question asks if the organisation was the first to develop any of its process innovations. The IB questionnaire delves considerably into innovation outcomes. It includes several questions on the positive benefits and negative effects of service, process, and organisational innovations. There are many other minor differences in the IB questionnaire

compared to the MEPIN questionnaire but the main difference is that the IB questionnaire provides considerably more opportunities for examining the effect of innovation strategies on outcomes. The MEPIN questionnaire, on the other hand, provides considerably more information on how public sector organisations innovate. NESTA collects detailed information on a range of external organisations as both a source of ideas for innovation and on their role in developing innovations. NESTA also collects information on the methods used to obtain external knowledge and the recipients of this knowledge within the respondent organisation. Thus the three surveys provide rather complementary insights at a larger scale.

Methodological work on how to measure public sector innovation is equally tackled in the NESTA and MEPIN projects. The **NESTA** working paper by Clark et al. (2008) presents the results of a feasibility study to explore current practice in the UK and overseas in respect to the measurement of innovation in the public sector. The paper presents three possible options to develop a public-sector innovation index:

- a government R&D scoreboard,
- a government innovation scoreboard and
- a government multi-factor productivity index.

An R&D scoreboard approach is deemed too limited since it would focus on R&D based innovation activities, whereas services' innovations are largely based on non-R&D activities. A multi-factor productivity index is appealing from a theoretical point of view (where productivity gains are the ultimate results of innovation) but it is not feasible yet to implement since it requires detailed time series data for all Member States, not available.

The innovation scoreboard approach was seen as the most realistic approach and Clark et al. (2008) recommend using surveys to collect statistical data. A survey-based approach was tested by Hughes et al. (2011) in their pilot approach to measure innovation in the UK public sector, focusing in particular on National Health Services (NHS) and Local Government. Using a similar definition of innovation as defined in the Oslo Manual, data was collected via

structured Computer Assisted Telephone Interviews (CATI). For each organisation the senior person "most appropriate ... in [the] organisation responsible for innovation and improvement" was interviewed for more than half an hour on average.

The survey covered 64 Health (NHS) and 111 Local government organisations. Four different index scores were calculated for impact, activity, capability and conditions. Unsurprisingly, public sector organizations with innovation strategies are more innovative than organizations without such strategies and innovation within public sector organizations is driven by senior leadership. Respective response rates of the survey were 16% for NHS and 31% for Local Government. These response rates indicate that it is feasible to conduct specific innovation surveys among public sector organizations.

The **Nordic project on measuring public innovation (MEPIN)** is an adapted CIS-like survey. The survey was piloted in five Nordic countries involving more than 2000 responding organizations from central, regional and local government with an overall response rate of 45% (Bugge et al., 2011).

Innovation is defined as "the implementation of a significant change in the way [an] organisation operates or in the products it provides. Innovations comprise new or significant changes to services and goods, operational processes, organisational methods, or the way [an] organisation communicates with users. Innovations must be new to [an] organisation, although they can have been developed by others. They can either be the result of decisions within [the] organisation or in response to new regulations or policy measures."⁷

Product, process and organisational innovations are similar to the definitions used for measuring business innovation but where for business innovations can also include marketing innovations for public sector organisations, these were replaced by communication innovations, the latter defined as "the implementation of a new method of promoting the organisation or its services and goods, or new methods to influence the behaviour of individuals or others. These must differ significantly from existing communication methods in [an] organisation".

⁷ Innovation activities are defined as "all activities conducted in-house or externally through acquisitions which actually, or are intended to, lead to the implementation of innovations. These include: 1) In-house activities, such as in-house research and development (R&D); planning and design; market research and other user studies; feasibility studies, testing and other preparatory work for innovation; 2) Training and education of staff for innovation; 3) External R&D, other consultancy services for innovation; 4) Other external know-how (patents, licenses, etc); and 5) Acquisitions of machinery, equipment and software for innovation.

The results of the MEPIN survey show that 80-90% of public sector organizations have introduced an innovation (Table 4). Product or process innovations are more common in Denmark, Finland, Norway and Sweden whereas in Iceland organizational and communication

innovations are observed more. The results also confirm previous studies' findings about the important role of the management as the most important driver of public sector innovation and that a lack of funding is the most important barrier to innovation.

Table 4: Share of public sector innovators in the Nordic countries

	Denmark	Finland	Iceland	Norway	Sweden
Product innovation	71.9	55.0	71.2	56.7	43.9
Process innovation	71.9	63.1	54.2	67.1	61.0
Product or process innovation	84.4	71.8	76.3	74.6	68.8
Organisational innovation	66.4	61.7	86.4	62.9	56.8
Communication innovation	64.1	34.2	86.4	44.6	47.1
ANY INNOVATION	87.9	79.2	91.5	83.3	80.9

Source: Bugge et al. (2011)

The European Commission used a survey-based approach in the Innobarometer 2010 Analytical Report on Innovation in Public Administration. More than 4000 public administration organisations were interviewed. Some of the most interesting findings are:

- **Innovation in the public administration**

- At EU level, two-thirds of public administration institutions introduced a new or significantly improved service in the last 3 years.
- The likelihood of service innovation increased linearly with the size of the institutions. State institutions were just as likely as independent ones to introduce innovations.

- **Developing innovations**

- The single most important driver of innovation in the public sector was the introduction of new laws and regulations, followed by new policy priorities and mandated implementations of an online service provision.
- Three major sources of information supported innovation: ideas from staff, ideas from management and input from clients or users.
- Domestic sources of information were the most important. The EU Commission was almost as important as a single source of information as other non-domestic organisations, events or enterprises in other EU countries altogether.

- A top-down approach of innovation or innovation support has been prevalent in developing innovations. A bottom-up innovation culture was the least characteristic of the government sector.
- In terms of barriers to public administration innovation, a lack of financial and human resources stood out as the most important barrier.

- **Effects of innovations**

Innovations improved the work of public administrations and only rarely had negative effects reported. The positive effects of innovation included: improved user access to information due to service innovations; improved user satisfaction; more targeted services; a faster delivery of services; simplified administration; improved working conditions or employee satisfaction; and cost reductions resulting from innovations.

- **Public procurement**

More than half of the organisations involved with tendering indicated that the procurements delivered or contributed to innovative service solutions. Cost-cutting without service innovation was a somewhat less frequent outcome, as were reduced environmental impacts through solutions purchased by public procurement.

Due to sampling problems the Innobarometer 2010 did not cover the whole public sector but only public administration (defined as NACE 84.11 -General public administration activities- and NACE 84.12 -Regulation of the activities of providing healthcare, education, cultural services and other social services, excluding social security-).

Innovators in public administration follow three distinct innovation strategies (Arundel and Hollanders, 2011). The first consists of a policy driven approach to innovation, with innovation implemented in response to mandated changes in the agency budget, new laws or regulations, new policy priorities, or the mandated introduction of new services. The second is characterised by a 'bottom up' approach to innovation and is the opposite of the policy driven approach. Bottom up innovators have active management support for innovation and have implemented several policies to encourage the development of innovative ideas and tests of their efficacy. External knowledge innovators report high levels of barriers to innovation and seek to overcome them by drawing on sources outside of the agency for assistance with developing an innovation.

The **Australian Public Sector Innovation Indicators Project (APSII)** is a collaborative

effort between the Australian Public Service Commission, the Australian Bureau of Statistics, the Australian Innovation Research Centre and the Department of Industry, Innovation, Science, Research and Tertiary Education. APSII uses the conceptual model for measuring public sector innovation in Australia shown in Table 5.

The APSII questionnaire⁸ asks for 5 types of innovation: process innovations, product and service innovations, communication innovations and policy innovations, investments in innovation, innovation strategies and examples of both the most and least successful innovation. Early results from the cognitive testing of the APSII questionnaire⁹ show that it is difficult for respondents "to differentiate between the five types of innovations ... particularly between services, processes, and communication methods, between policy and process innovations, and between goods and services". The full pilot survey was launched 15 August 2012 inviting 473 respondents from 83 agencies asking questions on different types of innovations. The data from the full survey will be used for a report on public sector innovation to be published late 2012 or early 2012¹⁰.

Table 5: Australian framework for measuring public sector innovation

Inputs	Process	Outputs	Outcomes
Investment in innovation	Diffusion of innovation	Innovation (activities and implementation)	Societal and environmental impacts
Human resources and skills for innovation	Innovation collaborations	Types of innovation	Quality, efficiency and productivity
Staff attitudes and attributes to innovation	Innovation management practice	Innovation novelty	Improved employee satisfaction
Sources of innovation	Innovation culture & leadership	Innovation intensity	Benefits for users
Technological infrastructure for innovation	Innovation strategy	Intangible outputs (e.g. trademarks, copyrights)	Other intangible effects (e.g. trust and legitimacy)
Environmental conditions			
User demand and supplier capacity	Wider public sector leadership and culture	Political and legislative factors	Other enablers/barriers for innovation (e.g. research basis, skill shortage)

Source: Table 1 in draft discussion paper for the Australian Public Sector Innovation Indicators Project

⁸ The pilot survey is available at: <https://innovation.govspace.gov.au/files/2012/09/APSII-Questionnaire.pdf>

⁹ <http://innovation.govspace.gov.au/2012/09/12/preliminary-findings-of-the-cognitive-testing-of-the-australian-public-sector-innovation-indicators-apsii-questionnaire/>

¹⁰ <http://innovation.govspace.gov.au/2012/09/12/australian-public-sector-innovation-survey-launched/>

The latest Trends and Challenges in Public Sector Innovation in Europe

In parallel with the EPSIS study, another unique study on public sector innovation commissioned by the European Commission was published entitled Trends and Challenges in Public Sector Innovation in Europe (Rivera Leon et al., 2012). The study presents an overview of Public Sector Innovation (PSI) as revealed by a pan-EU survey, comprising an account of officials' perceptions of PSI across the EU, and selected case studies of both successful and unsuccessful innovations.

The survey results reveal a consensus across public officials Member States as to what is meant by PSI: it is understood to mean new or improved services or processes. Critically, public officials see innovation as a means by which to address deepening budgetary pressures, through organisational and technological developments that promise more efficient administration or service delivery. PSI is also seen as a way to confront new societal demands, through different and more effective service design. It applies across all areas of the public sector, and is motivated by the need to provide more and better services for less cost.

The Trends and Challenges (T&C) report shows that successful innovations may be found in most EU member states and that these developments can deliver substantial cost savings. For example, Portugal's SIMPLEX Programme, which is pursuing administrative simplification on the one hand and an extension of eGovernment on the other, is estimated to have generated savings of €51.6 million. Similarly, the UK's Red Tape Challenge has delivered many economies including €1.2 billion of anticipated savings from reforms to environmental regulation. Elsewhere, e-procurement initiatives in Lithuania have resulted in costs savings of at least €176 million, following the introduction of a new system in 2010. Lastly, the National Revenue Agency of Bulgaria has estimated that citizens are expected to save approximately €2m per year from the use of a new twelve-digit Personal Identification Number (PIN). There are many other successful examples in Member States.

Notwithstanding the cross-section of successful examples of public sector innovation, the Trends and Challenges study found there is a sharp divide between Member States around PSI, with a smaller number of leading countries (longstanding commitment, widespread experience, demonstrable success) and a longer list of MS that might best be described as 'innovation followers.'

While the Trends and Challenges report was able to conclude that country A was doing rather more than countries B, C and D, differences in the volume of activity and range of strategies suggest that the Nordic countries are amongst the most advanced. The Netherlands and the UK are similarly seen by many to be at the forefront of efforts to make public sector innovation a universal imperative.

For the countries at the leading edge, PSI has breadth and depth. It seems to comprise three things: (i) mega projects, that are concerned to transform the cost-performance of whole systems; (ii) inter-agency initiatives, to streamline overall service delivery through de-duplication, but also to add new functionality through new connections; (iii) increased bottom-up input, whether that is from junior staff or the public. EU MS 'followers' are at an earlier stage and continuing to focus on digitising aspects of their public administration in the main.

This empirical research suggests that any future EPSIS development work may need to devise data collection strategies that can distinguish between the extent of PSI efforts across the spectrum of public services. There are other qualities one might wish to reveal through a future scoreboard, whether that is the degree to which innovation is becoming habitual or the nature of the innovation process itself (what drives it and who is involved).

While the Trends and Challenges study was able to find various cost-benefit analyses that estimate the benefits of a specific public-sector innovation, this case material is not yet sufficient for countries to be able to estimate the overall benefits to PSI. In the interim however, there may be an opportunity for a future EPSIS to gather outcome information on a related topic – regulatory reform and simplification – where most EU member states have adopted the European Commission's improvement targets (25% cost savings by 2012) and report progress annually.

On the subject of measurement, **the Trends and Challenges study suggests that further efforts to develop the measurement and benchmarking of PSI would be of interest to most Member States.**

There is a strong sense that enough is known about the issues for the Commission to launch a series of additional and substantive measurement (research) exercises in conjunction with the member states, perhaps using Article 185 as the instrument, and bringing together a cross-section of 'volunteer' EU MS. The opening projects may look to target two or three 'sectors,' perhaps including key aspects of public administration, healthcare provision and energy and environment (inasmuch as these address directly various European grand challenges).

4. EPSIS measurement framework

4.1. Conceptual framework

The APSII model for measuring public sector innovation uses a conceptual framework based on “five main themes: inputs to innovation, innovation processes, outputs of innovation, outcomes of innovation, and environmental conditions that affect innovation in the public sector.”

For EPSIS we adopt a conceptual model along the lines of the Innovation Union Scoreboard measuring business innovation distinguishing between Enablers, Activities and Outputs¹¹ (Table 6). Outputs in EPSIS will also include the impact of public sector innovation on business performance.

There are differences between the different administrative layers (national/regional/local public organisations) of the public sector¹², e.g. they have more or less narrowly defined areas of operations. Innovation can also be different for these administrative layers: “Depending on which level of government a particular organisation is organised there are different approaches to innovation activities. There are also differences in the areas that a particular level of government operates. To exemplify, municipalities, often very heterogeneous within themselves as they work with everything from social work to education and health, are different from e.g. National government agencies. Government agencies, by nature, tend to have more narrowly defined area of operations. Areas of operations may not always be different from the problems encountered in the Community Innovation Survey but may be even more important to bear in mind when surveying public institutions”

(MEPIN project). The conceptual model does not differentiate between different administrative layers of the public sector as current data availability does not allow such a breakdown.

For measuring company innovation a huge amount of data is available from R&D surveys, innovation surveys and patent data. For innovation in the public sector hardly any data are available as there is no tradition in measuring innovation in this sector. Given data availability this pilot EPSIS will focus on innovation in public administration only.

¹¹ Enablers capture the main drivers of innovation performance external to the firm and it differentiates between 3 innovation dimensions. ‘Human resources’ measures the availability of a high-skilled and educated workforce. ‘Open, excellent and attractive research systems measures’ the international competitiveness of the science base. ‘Finance and support’ and measures the availability of finance for innovation projects and the support of governments for research and innovation activities.

Firm activities capture the innovation efforts at the level of the firm and it differentiates between 3 innovation dimensions. ‘Firm investments’ includes both R&D and non-R&D investments that firms make in order to generate innovations. ‘Linkages & entrepreneurship’ measures entrepreneurial efforts and collaboration efforts among innovating firms and also with the public sector. ‘Intellectual assets’ captures different forms of Intellectual Property Rights (IPR) generated as a throughput in the innovation process.

Outputs capture the effects of firms’ innovation activities and it differentiates between 2 innovation dimensions. ‘Innovators’ measures the number of firms that have introduced innovations onto the market or within their organisations, covering both technological and non-technological innovations and the presence of high-growth firms. ‘Economic effects’ captures the economic success of innovation in employment, exports and sales due to innovation activities.

¹² The Innobarometer 2010 data show that 87% of local administration innovate, 92% of regional administration and 93% of national administration. In particular local administration seems to be less innovative.

Table 6: Measurement framework

ENABLERS	
1.1 HUMAN RESOURCES	
1.1.1	Employment share of 'creative occupations'
1.1.2	Share of employees in public administration with a university degree
1.2 QUALITY OF PUBLIC SERVICES	
1.2.1	Government effectiveness
1.2.2	Regulatory quality
1.2.3	Increased efficiency of government services due to the use of ICT
1.2.4	Online availability of public services
1.2.5	E-government development index (EGDI)
ACTIVITIES	
2.1 CAPACITIES	
2.1.1	Share of service innovators that innovate in-house
2.1.2	Share of process innovators that innovate in-house
2.2 DRIVERS AND BARRIERS	
2.2.1	Importance of internal barriers to innovation
2.2.2	Importance of external barriers to innovation
2.2.3	Active management involvement in innovation
2.2.4	Importance of external knowledge
2.2.5	Share of employees involved in groups that meet regularly to develop innovations
OUTPUTS	
3.1 INNOVATORS	
3.1.1	Share of organizations in public administration with services, communication, process or organisational innovations
3.1.2	Share of 'New' services out of all services innovations
3.1.3	Public sector productivity
3.2 EFFECTS ON BUSINESS PERFORMANCE	
3.2.1	Improvements in public services for business
3.2.2	Impact of innovative public services on business
3.3 GOVERNMENT PROCUREMENT	
3.3.1	Government procurement as a driver of business innovation
3.3.2	Government procurement of advanced technology products
3.3.3	Importance of innovation in procurement

For the group of Enablers 7 indicators are used for two innovation dimensions. The Human resources dimension measures the 'quality' of employees in public administration by using the share of employment with a higher education degree and those working in 'creative' occupations. The *Quality of public services* dimension measures both the quality of such services within the public sector as the effect on the society at large.

The group of Activities distinguishes between two dimensions. The *Capacities* dimension captures the in-house innovation capacity of public administration organisations similarly to that for firms in the IUS using two indicator measuring the share of innovation that were developed in-house. The *Drivers and barriers* dimension focuses on the relative importance of internal and external barriers and the role of management in developing innovation in public administration.

For the group of Outputs 8 indicators are used to measure performance in three innovation dimensions. The *Innovators* dimension captures how many public administration organisations innovate and if their innovations are more radically new. The *Effects on business performance* dimension captures if improved or innovative public services have had a significant impact on firm performance. The *Government procurement* dimension captures the role of government procurement as a driver of business innovation.

4.2. Linkages between the indicators

The EPSIS indicators capture different aspects of public sector innovation. But it is unavoidable that there is some overlap between the different indicators and **no single indicator will fully capture only one aspect of public sector innovation**. The results of a correlation analysis (the detailed results are shown in Annex 3) show that within each of the dimensions **there is a fair amount of overlap between the indicators**. In the *Drivers and barriers* dimension the indicators on active management involvement and share of employees meeting in groups partly measure the same but there is no overlap with the other indicators on

internal and external barriers to innovation and the importance of external knowledge. In the *Innovators* dimension the indicator on public sector productivity does not correlate with the two indicators on share of innovators and share of 'new-to-market' services. Public sector productivity is strongly related to the *Quality of public services* dimension. In the *Government procurement* dimension the indicator on the importance of innovation in procurement does not relate with the other indicators in this dimension nor with any of the other indicators included in EPSIS.

Employment in creative occupations is strongly related with the share of employees with a university degree. The indicator is weakly related with the share of employees meeting in groups and negatively with the share of innovators. The share of employees with a university degree is strongly related with the share of employees meeting in groups to develop innovations and negatively with public sector productivity. The first result suggests that in particular **more highly educated employees in public administration are involved in developing innovations**.

Government effectiveness correlates significantly with regulatory quality, increased efficiency of government services due to ICT, E-government and public sector productivity and negatively with internal barriers to innovation. The last result suggests that the presence of **internal barriers to innovation not only hinder innovation but also government effectiveness in general**.

Regulatory quality correlates significantly with increased efficiency of government services due to ICT, E-government, and public sector productivity and negatively with internal barriers to innovation. Government effectiveness and regulatory quality both capture the overall quality of the government sector as they are highly related. Increased efficiency of government services due to ICT behaves similar to government effectiveness and regulatory quality but it is different as it also correlates the online availability of public services. The use of ICT has a double effect: it increases both the online availability and efficiency of public services.

The share of in-house service innovators correlates significantly with the overall share of innovators and the share of 'new-to-market' service innovations. The share of in-house process innovators also correlates significantly with active management involvement and the share of employees meeting in groups to develop innovations. **Management involvement and employee involvement are relevant for process innovations but not for service innovations.**

Internal barriers correlate significantly with external barriers and external knowledge. Active management involvement correlates significantly with the share of employees meeting in groups to develop innovations. The share of employees meeting in groups to develop innovations correlates negatively with public sector productivity, a result which is difficult to interpret.

The two indicators capturing the effects on business performance are different from the other indicators as they are opinion-based indicators where firms are asked for their opinion on the performance of the public sector. These indicators only correlate with a few of the other indicators, with the indicator capturing the observed share of improved public services correlating positively with the share of employees with a university degree, active management involvement, importance of external knowledge and public sector productivity. The opinion that innovative public services have had a significant impact of business performance is not correlated with any of the other indicators except for the indicator on the observed share of improved public services. These results seem to suggest that **the impact of public sector innovation is more relevant for the internal efficiency of public administration organisations than for firms** or the impact is not observed as such as improved public services are not linked to public sector innovation by business firms.

Government procurement is assumed to have a positive impact on business performance and business innovation. But the results also show that government procurement is correlated with government effectiveness, regulatory quality, increased efficiency of government services due to ICT, online availability of public services, E-government, in-house service and process innovators and share of innovators in public administration. **Countries with a better performing and more innovative public sector also put higher demands on their procurement activities by demanding more innovative solutions from business firms.** However, the relative importance of innovation in procurement as compared to low cost is not correlated with any of the indicators.

A comparison of the EPSIS indicators with the Innovation Union Scoreboard innovation performance shows that in particular the indicators in the *Quality of public services* dimension, public sector productivity and government procurement correlate significantly with the IUS Summary Innovation Index (SII) and the 8 IUS innovation dimensions (cf. Annex 4): **a highly productive public sector delivering high quality services and strong overall innovation performance are clearly linked.** The two opinion indicators on the effect of improved public services and innovative public services on business performance correlate negatively with the IUS Human resources dimension. The results for the second EPSIS dimension clearly show the importance of high quality public services for business innovation performance.

5. European Public Sector Innovation Scoreboard

For each of the EPSIS indicators section 5.1 first provides the key findings, a brief rationale and a short description of the indicator. The discussed results are based on the most recent available data and, where available, trends over time. Section 5.2 presents a scoreboard highlighting countries' performance on the indicators compared to average performance. Section 5.3 presents country profiles for each country.

5.1. EPSIS indicators: Definitions and results

1.1. Human Resources (Enablers)

Indicator 1.1.1 Employment share of 'creative occupations'

Key findings

- About 23% of the workers in public administration in EU27 countries are employed in creative occupations.
- The highest shares of creative occupations with at least 40% can be found almost exclusively in Nordic and Baltic countries (Iceland, Latvia, Lithuania, Norway) and in Slovenia.

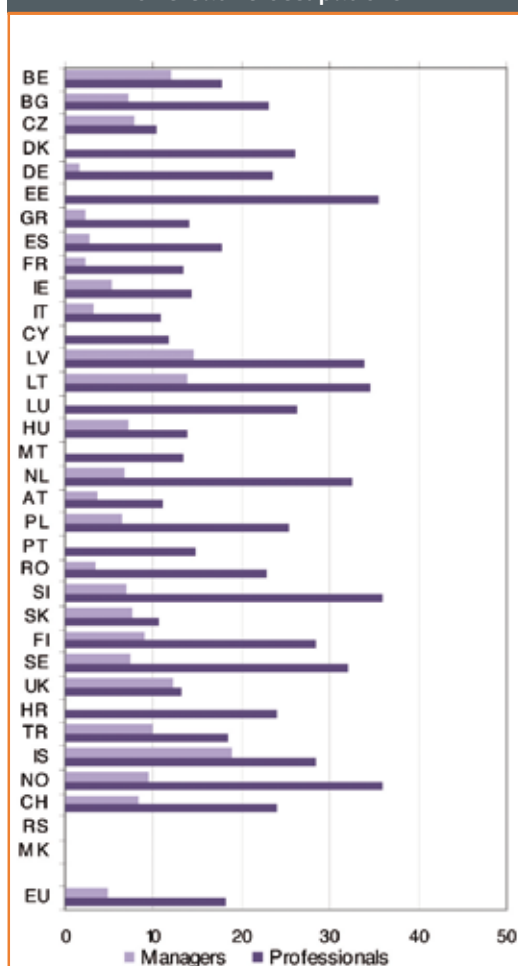
Background

Richard Florida in his 2002 study "The Rise of the Creative Class" stated that regions with high concentrations of technology workers, artists and musicians experience higher levels of economic development. This "creative class" would foster an open, dynamic and professional environment. Many studies have adopted this concept of creative workers at national and regional level as a proxy for the share of population in creative occupations. In the NIS 2003 report a similar indicator was used to capture the receptiveness to new ideas and the NIS 2003 report referred to this indicator as coming "closest to measuring social creativity at the national level".

Methodology

The indicator is constructed following the International Standard Classification of Occupations (ISCO) by including ISCO-88 classes 1 and 2. E.g. Lorenz and Lundvall (2009) state that "Florida's creative class is composed of Management Occupations (ISCO 12–13), Professionals (ISCO 21–24) and some of the

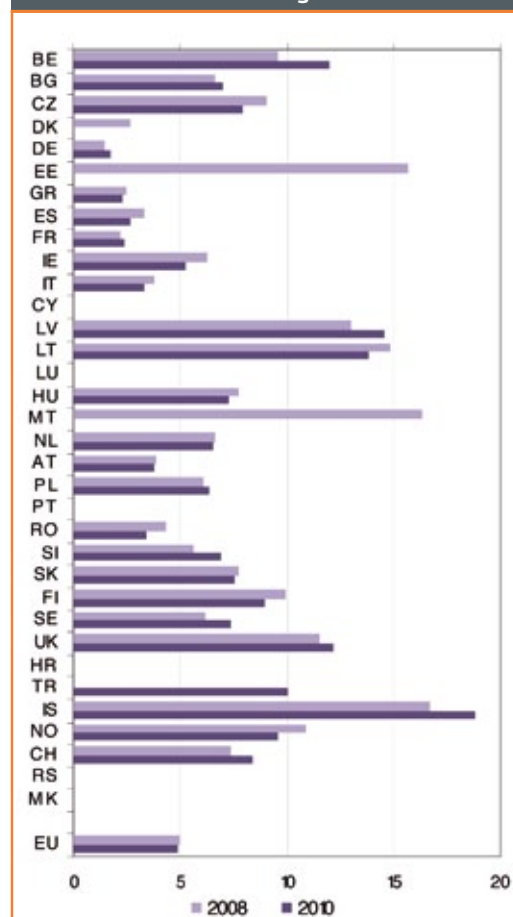
Figure 2: Employment share of creative occupations



Source: Eurostat, data based on ISCO-88. No data for managers for DK, EE, CY, LU, MT, PT, HR

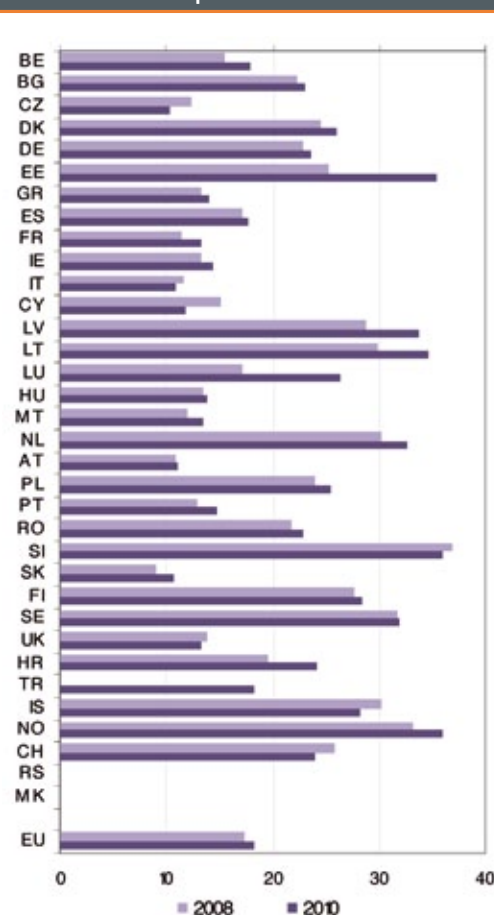
occupations classified as Technicians and Associate Professionals (ISCO 31–34)” (references to ISCO-88). As detailed data are not readily available, creative occupations are estimated by using aggregate ISCO-88 classes 1 and 2. About 23% of workers in public administration in the EU27 are in creative occupations. The highest shares of creative occupations at 40% or above are in Iceland, Latvia, Lithuania, Norway and Slovenia (Figure 2). For most countries the share of professional workers is considerably higher than that for managers, in particular in Germany, Greece, Romania and Spain.

Figure 3: Employment share of ‘managers’



Source: Eurostat, data based on ISCO-88

Figure 4: Employment share of ‘professionals’



Source: Eurostat, data based on ISCO-88

Comparable trend data are not available before 2008 due to a change from NACE Rev. 1.1 to NACE Rev. 2. Over the years 2008-2010 the share of creative occupations is quite stable. At the more detailed level the employment share of managers has increased with more than 20% for Belgium and Slovenia and decreased with more than 20% in Romania (Figure 3).

The employment share of professionals has increased with more than 20% in Croatia, Estonia and Luxembourg and has decreased with more than 20% in Cyprus (Figure 4).

Indicator 1.1.2 Share of employees with a higher education degree**Key findings**

About 30% of employees in Europe's public administrations have a university degree.

Background

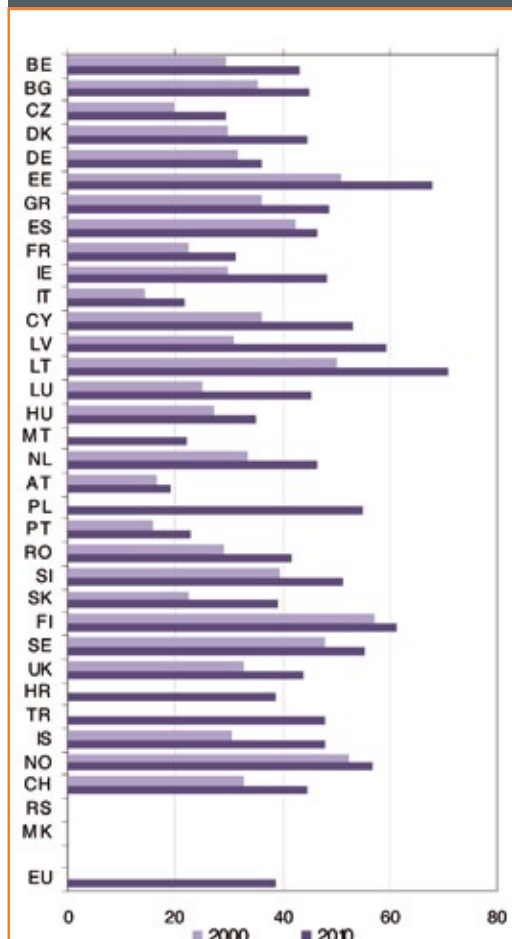
An indicator on educational attainment could be constructed using data on Human Resources in Science and Technology (HRST). HRST data are based on a common manual of the measurement of human resources devoted to science and technology - the Canberra manual, jointly written by the OECD, the European Commission, UNESCO and the International Labour Office (ILO). In this manual, highly skilled human resources are described as essential for the development and diffusion of knowledge and constitute the crucial link between technological progress and economic growth, social development and environmental well-being.

Although technological innovation is not as dominant in the public sector as compared to the private sector, employees with a completed degree in Science & Technology (S&T) are important for the adoption (diffusion) or articulation (development) of an important share of public sector innovations. This capacity is going to be important to any organisation's absorptive capacity and its ability to function as an intelligent customer, e.g. when specifying and procuring innovation extramurally.

Methodology

HRSTE is a subset of HRST and includes those people who successfully completed education at the third level in an S&T field of study. HRSTE data available from Eurostat for public administration also include 'Activities of extraterritorial organisations and bodies. The indicator could then be calculated as the share of employment in HRSTE in public administration out of total employment in public administration.

The average employment share in HRSTE in the EU27 is high at 39% in 2010 and has been increasing steadily and significantly from 32% in 2004 (Figure 5). There is a wide spread in performance across Europe. In Austria, Italy, Malta and Portugal employment shares are below 25% whereas in Estonia, Finland

Figure 5: Share of HRSTE

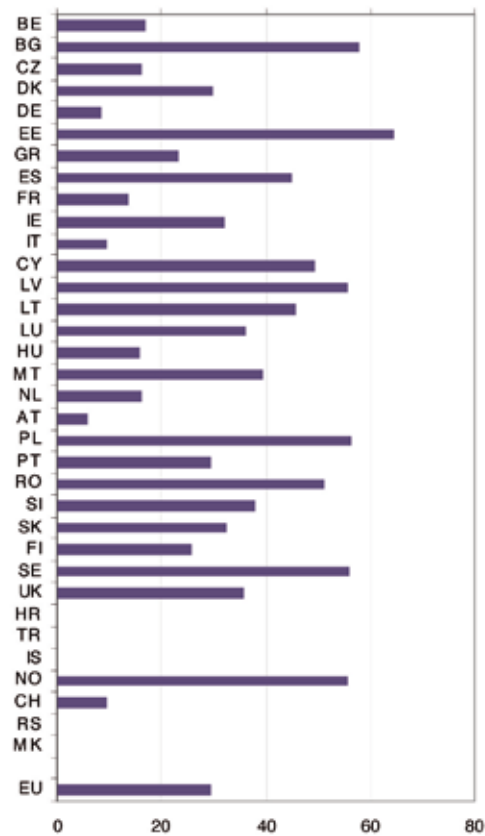
Source: Eurostat

and Lithuania employment shares are above 60%. For all countries for which 2000 data are available HRSTE employment shares have increased, in particular in Latvia, Lithuania¹³ and Luxembourg.

Using HRSTE data however introduces a focus (or bias) towards technology driven innovation as graduates in Social Sciences and Humanities (SSH) are excluded. Within services in general and public administration in particular, many innovations are assumed to be non-technology driven. A focus on S&E graduates may be too limited, thus, we use data from the Innobarometer 2010.

¹³ The employment share for Lithuania in 2000 was replaced with that in 2001 due to a break in series.

Figure 6: Share of employees with a university degree



Source: Innobarometer 2010

Question Q8 from the Innobarometer 2010 asks public administration organisations:

In 2010, approximately what percent of your organisation's employees had a university degree?

Respondents could tick one of the following answer categories:

0% / Between 1% and 9% / Between 10% and 24% / Between 25% and 49% / Between 50% to 74% / 75% or more / [Do not know/No answer]

As precise percentages are not available, the indicator was constructed by applying weights to the different answer categories:

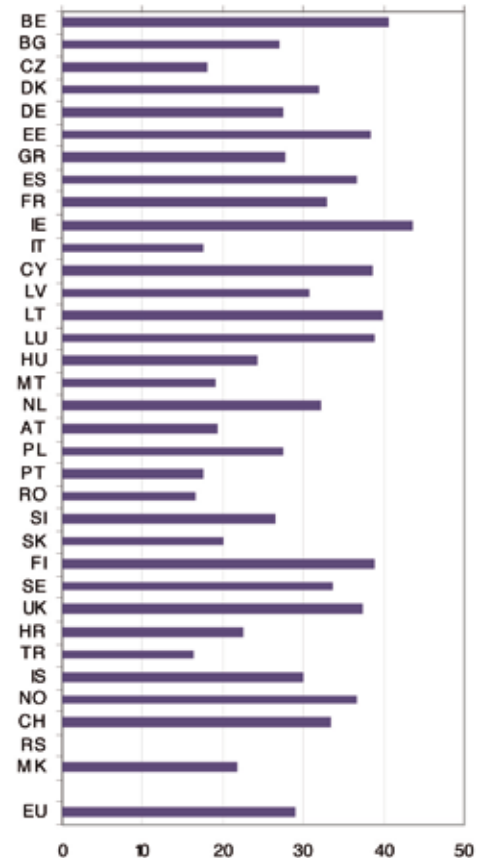
Share of employees with a university degree =
 $0 \times [\text{share } 0\%] + .05 \times [\text{share between } 1\% \text{ and } 9\%]$
 $+ .17 \times [\text{share between } 10\% \text{ and } 24\%] + .37 \times [\text{share between } 25\% \text{ and } 49\%]$
 $+ .62 \times [\text{share between } 50\% \text{ and } 74\%] + .875 \times [\text{share } 75\% \text{ or more}]$

Where the shares are taken to be halfway the lower and upper limits of the answer categories. Percentage shares are calculated excluding the [Do not know/No answer] responses.

The share of employees in public administration with a university degree is about 30% in the EU27 (Figure 6). But there is a very wide spread in performance with a below 10% share for Austria, Germany, Italy and Switzerland and an above 55% share for Bulgaria, Latvia, Poland, Sweden and Norway and even almost 65% for Estonia.

Results seem to be counterintuitive when compared with LFS data on educational attainment for all people employed (Figure 7). For the EU27 29% of all people employed have completed higher education, a result is almost identical to that using Innobarometer 2010 data. But for individual countries differences can be more substantial. The shares using Innobarometer data are about twice as high compared to using LFS data for Bulgaria, Latvia, Malta and Poland and even three times as high for Romania whereas for Austria, Belgium, Germany, France, Netherlands and Switzerland we observe the opposite with much smaller shares using Innobarometer data.

Figure 7: Share of employment with a higher education degree



Source: Eurostat, Labour Force Survey. Data for 2010

1.2. Quality of public services (Enablers)

Indicator 1.2.1 Government effectiveness

Key findings

Government effectiveness encounters stable trends since 2000, however with high discrepancies between EU15 and EU12 groups of countries with government effectiveness falling for the EU15 countries.

Background

The Government effectiveness indicator is part of the Worldwide Governance Indicators (WGI) project that was initiated at the end of the 1990s in order to measure the dimensions of governance. Governance is defined by the WGI as “the traditions and institutions by which authority in a country is exercised. This includes the process by which governments are selected, monitored and replaced; the capacity of the government to effectively formulate and implement sound policies; and the respect of citizens and the state for the institutions that govern economic and social interactions among them.”¹⁴

The Government effectiveness indicator “captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government’s commitment to such policies.”¹⁵ It is composed of indicators relating to the quality of bureaucracy, quality of provision of public goods such as public schools, general infrastructure, transportation, as well as consistency of public policies and quality of budget management in public administration.

The degree of effectiveness of a government is anticipated to have a close link to the innovation policy performance. Celikel Esser (2007) found that the innovation performance captured by the Summary Innovation Index of a country (published in the European Innovation Scoreboard) has a strong association with the government effectiveness indicator.¹⁶

The government effectiveness indicator is composed by compiling 37 sub-indicators, stemming from 15 sources of data. The sources range from surveys of households and firms (e.g. Gallup World Poll, the World Economic Forum Global Competitiveness Report survey), public sector organisations (e.g. World Bank and regional development banks), Non-Governmental organisations (including Bertelsmann Transformation Index etc) and commercial business information providers (4 data sources such as Economist Intelligence Unit, Global Insight etc).

Figure 8: Government effectiveness



Source: World Bank, Worldwide Governance Indicators 2000-2010

¹⁴ Kaufmann and Kraay, 2008, p. 6.

¹⁵ WGI, Government Effectiveness, <http://info.worldbank.org/governance/wgi/resources.htm>

¹⁶ Celikel Esser, F. 2007: p. 13-14.

¹⁷ WGI, Using the WGI, <http://info.worldbank.org/governance/wgi/resources.htm>

The values of the indicator range from -2.5 (weak) to 2.5 (strong) governance performance. They result from averaging the appropriate data from the 30 selected sources, and using a statistical model (the Unobserved Components Model) to make the data comparable across sources. The data is also reported based on a percentile rank (ranging from 0 to 100), which gives the performance of the countries against each other, for each governance dimension measured. The comparison of data over time needs to be treated with care, as the changes in governance indicators may also reflect changes in the source data, the inclusion of new sources of data for a specific country, or changes in weights to aggregate the individual sources. However, over a long-term period of ten years, for instance, the trends in governance may be considered significant.¹⁷

Government effectiveness: Positive trends

At the EU27 level, government effectiveness has had a stable trend since 2000, staying at an average of around 1.17 (Figure 8). There are, however, high discrepancies between the developments of the indicators in the EU15 and EU12 groups of countries. In the EU15, the average value for government effectiveness experienced a downward trend, falling from a value of 1.70 in 2000, to 1.48 in 2010. In contrast, the average performance of the EU12 countries is much lower, but it is steadily increasing, rising from a value of 0.51 in 2000 to 0.79 in 2010.

In the EU, Finland and Denmark exhibit the highest values for government effectiveness in 2000 and 2010 as well. Finland has had the leading position, rising from a value of 2.13 in 2000 to 2.24 in 2010. Other constant performers are Sweden, Austria and the Netherlands. It is also visible that there has been a drop in government effectiveness among the top performers Luxembourg (who fell from 2.06 to 1.71), as well as Germany (falling from 1.99 in 2000 to 1.55 in 2010), United Kingdom (falling from 1.83 to 1.56), and Ireland (falling from 1.66 to 1.31). A considerable decrease in government effectiveness happened in Spain, whose score fell from a high of 1.82 in 2000 to 0.98 in 2010.

At the other extreme are New Member States such as Romania, with the lowest government effectiveness value in the EU27, of -0.51 in 2000, though an improved performance to -0.14 in 2010. Romania is followed by Bulgaria, which stagnated at a value of -0.05-0.01 in 2000-2010. Nevertheless, the data show that most of the New Member States improved the quality of public services and policy formulation and implementation. For instance, countries such as Lithuania increased their scores from 0.08 in 2000 to 0.72 in 2010, or Poland from 0.58 in 2000 to 0.71 in 2010.

Indicator 1.2.2 Regulatory quality

Key findings

- The EU27 average regulatory quality has slightly increased between 2000 and 2010.
- Regulatory quality is highest in the Nordic countries and the Netherlands.

Background

Regulatory Quality (RQ) is a further indicator constructed within the Worldwide Governance Indicator project based on a similar methodology as for the indicator on government effectiveness. It captures *"perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development."*¹⁸ The indicator's values range from approximately -2.5 (weak) to 2.5 (strong) regulatory quality performance.

As opposed to the previous indicator (government effectiveness), this indicator focuses more directly on the content of policies and their effect on the private sector. This governance dimension is composed of indicators that generally measure the presence of market unfriendly policies such as price controls or inadequate bank supervision, ease of starting a business, distortionary effects of the tax system, as well as perceptions of the burdens imposed by administrative regulations in areas such as foreign trade and business development (Celikel Esser, 2007). Excessive regulation will have a negative impact on business performance and regulation.

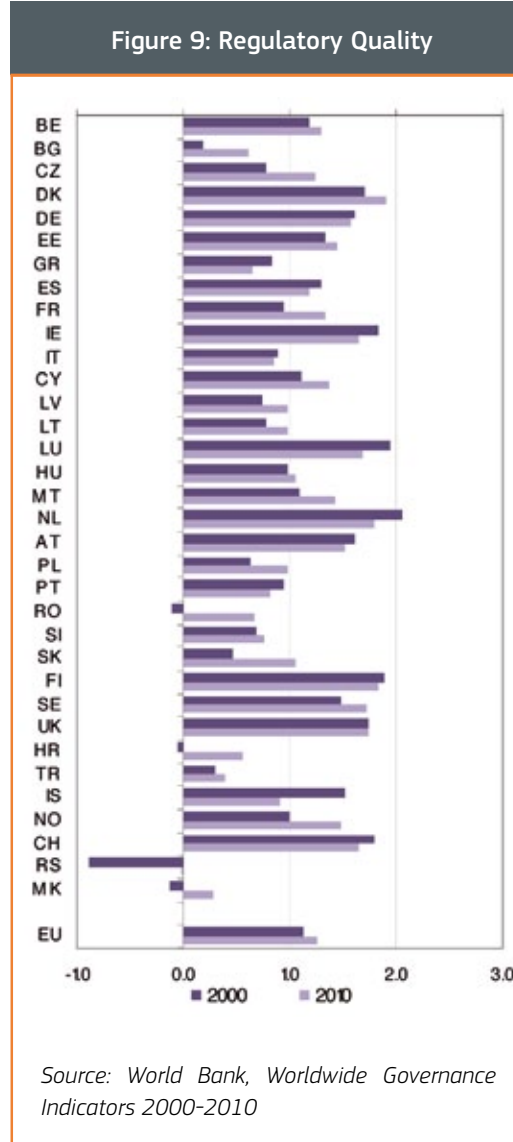
Methodology

The regulatory quality indicator is constructed by aggregating 53 sub-indicators from 14 sources of data. The sources range from surveys of households and firms (e.g. the World Economic Forum Global Competitiveness Report survey), public sector organisations (e.g. World Bank), Non-Governmental organisations (including Bertelsmann Transformation Index etc) and commercial business information providers (4 data sources such as Economist Intelligence Unit, Global Insight etc).

Regulatory quality on the rise

The EU27 average regulatory quality has slightly increased on average in the period of 2000-2010, rising from 1.13 points to 1.26 (Figure 9). This was mostly influenced by the rising quality of the EU12 countries, which improved the abilities of their governments to implement sound policies and regulations promoting the private sector. The EU12 average has risen from 0.72 to 1.04 in this period, while the EU15 average stayed mostly constant, at around 1.45.

In 2000, the best regulatory quality in EU27 was perceived to be in the Netherlands (score of 2.06), Luxembourg (1.95) and Finland (1.89), but the performances changed until 2010, when Denmark was the leading country (score of 1.90), followed by Finland (1.84) and the Netherlands (1.79). The New Member States improved their performance within 2000-2010 as well. Notable evolutions are in Romania, which



increased from -0.12 to 0.66, in Bulgaria (rising from 0.19 to 0.61) and Slovakia (rising from 0.46 to 1.05).

Non-EU countries also made considerable progress in terms of regulatory quality, with Serbia rising from -0.88 in 2000 to -0.02, Croatia from -0.05 to 0.56, and the Former Yugoslav Republic of Macedonia from -0.12 to 0.28.

¹⁸ Worldwide Governance Indicators, Regulatory Quality, <http://info.worldbank.org/governance/wgi/resources.htm>

Indicator 1.2.3 Increased efficiency of government services due to the use of ICT**Key findings**

- Government innovate by applying and investing in advanced ICT.
- The latest data show an average of 4.58 points (of 7) at EU27 level for the positive effect of ICT use on government's efficiency.

Background

Efficiency increases resulting from the use of advanced ICT can be attributed to innovation, as this is an example of innovation by adoption. Although ICT-enabled improvement in government services can be seen as innovation output for the public sector, here, the indicator is interpreted to be an (innovation) enabler for the private sector.

The World Economic Forum issued the Global Information Technology (IT) Report on an annual basis for a decade. The indicator chosen here provides the extent to which the private sector perceives the government's use of ICT as having an effect on improving the efficiency of the government services.

Methodology

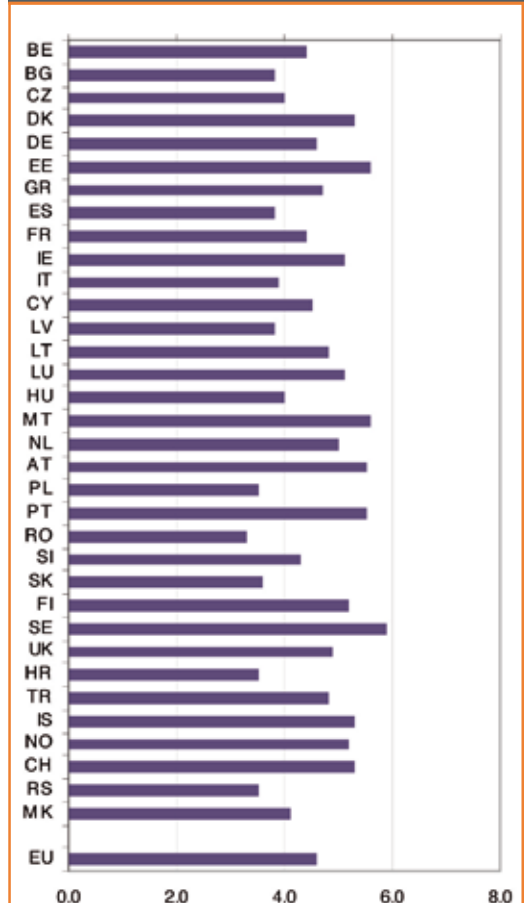
Data are collected based on the results of the Executive Opinion Survey undertaken by the WEF together with Partner Institutions.¹⁹

It is measured on a scale from 1 (=no effect) to 7 (=has generated considerable improvements), rated by the business executives involved in the study. The indicator is calculated based on the weighted average of the scores in two consecutive years.

Positive effects of ICT

The latest data show an average of 4.58 points at EU27 level for the positive effect of ICT use on the government's efficiency (Figure 10).

On average, ICT is considered to have generated improvements in the efficiency of EU governments.

Figure 10: ICT use and government efficiency 2010-2011

Source: World Economic Forum, 2012:
Global Information Technology Report,
p. 386

The business leaders' differences in perceptions towards the use of ICT by the governments are not very different between the EU15 (4.89) and EU12 groups (4.23), though there seem to be slightly bigger improvements in government efficiency in EU12 countries on average. The highest scores are obtained by Sweden (5.9), Estonia (5.6), Malta and Austria (5.5), while at the lower end there are countries such as Romania (3.3) or Croatia and Poland (3.5).

¹⁹ See WEF 2012: Global IT Report 2012, indicator 10.03, p. 393

Indicator 1.2.4 Online availability of public services**Key findings**

- The online presence of public services at EU27 level increased considerably from 50% to 84% (2006 to 2010).
- The provision of services for enterprises has been growing, the online availability of services for citizens is lower.

Background

The online availability of public services is an indicator used for measuring the development of eGovernment in the EU. Having started as an indicator for measuring the progress towards reaching Lisbon Agenda targets, it has been integrated into the EU's Digital Agenda flagship initiative of the EU2020 strategy. It is one indicator used for measuring the progress of the eGovernment Action Plan for 2011-2015.²⁰

In the framework of EPSIS, the online availability of public services is considered an enabler of innovation for the private sector, as it facilitates the access to information and enhances the transparency of the public sector.

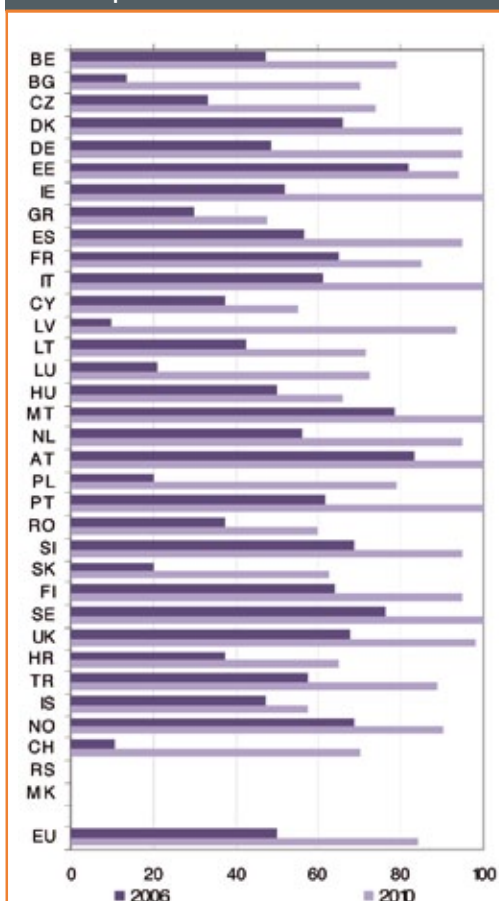
Methodology

According to the Eurostat Quality Profile description, this indicator gives the measure of the online availability of 20 basic public services that were defined by the Internal Market Council.²¹

1. **public services for citizens** (income taxes, job search services by labour offices, social security contributions, personal documents, car registration, application for building permission, declaration to the police, public libraries, certificates request and delivery, enrolment in higher education, announcement of moving, health related services);
2. **public services for businesses** (social contributions for employees, corporation tax, VAT, registration of a new company, submission of data to statistical offices, custom declarations, environment-related permits, public procurement).

The sophistication is assessed based on a 4-stage classification:

1. Basic information;
2. One-way Interaction;
3. Two-way interaction;
4. Full electronic case handling.

Figure 11: Online availability of public services 2007-2010

Source: Eurostat, Information society statistics
 * The earliest available figures for Bulgaria, Romania Turkey date from 2007 for Croatia from 2009

Online availability on the rise

According to the 2011 EU eGovernment Benchmark Report²², the availability of public services has been growing across Europe, and has started to be less problematic. The latest data, stemming from 2010 show that there are several countries where public services are (almost) 100% accessible online, such as Austria, Italy and Sweden, but also Denmark, Germany, Estonia, Slovenia and UK are very close to full online presence (Figure 11).

²⁰ European Commission, eGovernment, Action Plan 2011-2015, http://ec.europa.eu/information_society/activities/egovernment/action_plan_2011_2015/index_en.htm

²¹ See Council of the European Union, Report on the Action Plan "E-Europe 2002": Approval of the list of supplementary benchmarking indicators, http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/misc/06782.en1.html

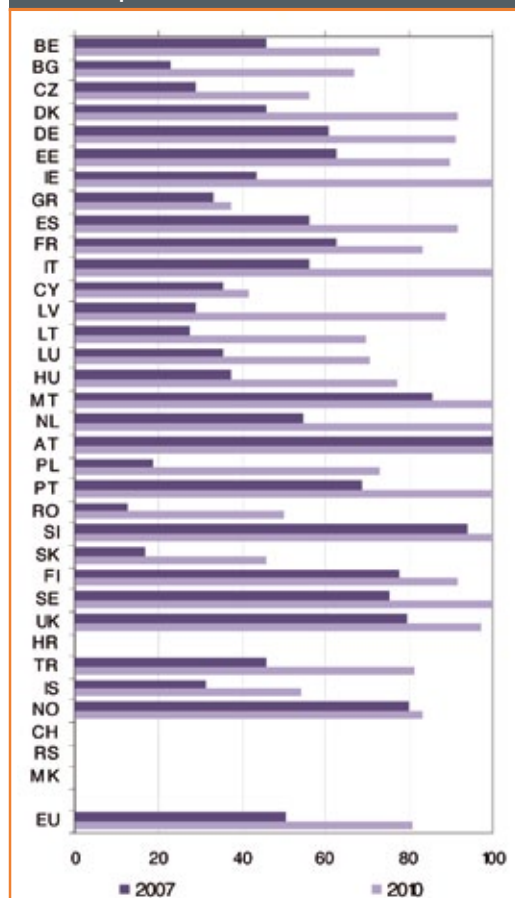
²² See European Commission, 2011: Digitizing public services in Europe: Putting ambition into action – 9th Benchmark measurement, http://ec.europa.eu/information_society/newsroom/cf/item-detail-dae.cfm?item_id=6537

Advantages for the business sector

In comparison to previous years, the trend has been positive in all countries, as the online presence of the public services at EU27 level increased considerably in a very short period of time, rising from 50% in 2006 to 84% in 2010.

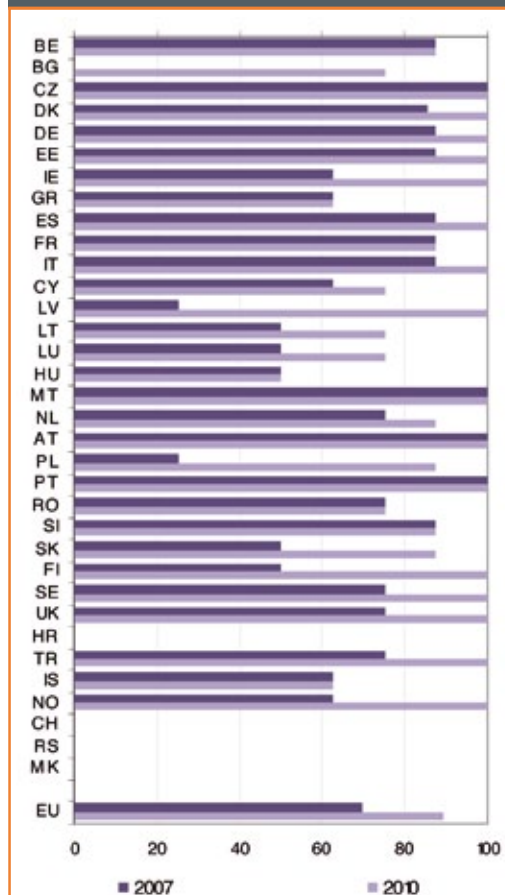
It is also striking that the average shares of online public services available in EU15 versus EU12 have each been growing by around 30% - at a similar pace. Thus, by 2010, the coverage of online public services reached 90% in EU15 countries and 76.63% in EU12 countries. At the Member States level, there have been tremendous improvements in Bulgaria, for instance, where the online presence grew from 13.75% in 2007 to 70% in 2010, and in Poland, where the online presence rose from 20% in 2006 to 78.75% in 2010.

Figure 12: Online availability of public services for citizens



Source: Eurostat, Information society statistics

Figure 13: Online availability of public services for businesses



Source: Eurostat, Information society statistics

More to do for private households

However, as also noticed in the Digital Agenda Scoreboard 2012, in spite of the fact that the provision of services for enterprises has been growing, the online availability of services for citizens is lower, which needs to be tackled with future policy initiatives (Figure 12).²³

Comparing the evolution of the online availability of public services for citizens in 2007-2010, they have increased from an average of 50% in 2007 to an average of 81% in EU27 in 2010.

The availability of services for businesses has increased from an average of 70% in 2007 to 89% in 2010 at the EU27 level. However, the EU12 still needs to catch up especially in providing more public services for citizens, as the average availability is still below the EU27 average, reaching 71% in 2010 (Figure 13).

²³ See European Commission, 2012: Digital Agenda Scoreboard, http://ec.europa.eu/information_society/digital-agenda/scoreboard/index_en.htm

Indicator 1.2.5 E-Government Development Index (EGDI)

Key findings

- Most of the EU27 Member States improved in providing public services through the use of ICT.
- Highest improvements in Cyprus, France, Lithuania, Netherlands, Spain, and Serbia.

Methodology

*"The United Nations e-government development index (EGDI) is a composite indicator measuring the willingness and capacity of national administrations to use information and communication technology to deliver public services."*²⁴ It presents the landscape of the global use of ICT by the government throughout its policies and services.

E-government has been broadly defined as the use of ICT by the government in the provision of services, and in interactions with citizens, business and other governments. Thus, three types of interactions are recognized within the realm of e-government: G2G (government to government), G2C (government to citizens and reverse), G2B (government to business and reverse). The United Nations Global Survey on E-government only limits itself to the G2C and C2G types of interactions.²⁵

Composition of the EGDI index

In order to obtain the EGDI, the e-government policies for service delivery, online presence and technical qualities of the websites of the 193 UN Member States are surveyed on a biannual basis. The assessment was based on three dimensions of e-government: the online service index, telecommunication index and human capital index. After their statistical standardization that accounts for the variance in each sub-index, they have an equal weighting in the composition of the EGDI:

$$\begin{aligned} \text{EGDI} = & \\ & (\frac{1}{3} \times \text{online service index}) \\ & + (\frac{1}{3} \times \text{telecommunication index}) \\ & + (\frac{1}{3} \times \text{human capital index}) \end{aligned}$$

The *Online Service Index* comprises an assessment of a country's national website, e-services portal and e-participation portal, as well as the websites of the ministries of education, labour, social services, health, finance and environment, which were given scores. These websites are assessed according to a framework of four stages of e-government development:

- an "emerging presence": only basic information provided;
- "enhanced presence": information on public policy and governance issues is provided in a greater extent, including reports, newsletters, databases;
- "transactional presence": two-way interaction is allowed between the citizens and the government, e.g. by paying taxes and applying for ID cards online;
- "connected presence": participatory deliberative decision-making is encouraged online through interactive features, e.g. through web comment form, online consultation mechanisms etc.

The *telecommunications infrastructure index* is given by the average of five indicators: estimated internet users per 100 inhabitants, number of main fixed telephone lines per 100 inhabitants, number of mobile subscribers per 100 inhabitants, number of fixed internet subscriptions per 100 inhabitants, and number of fixed broadband facilities per 100 inhabitants. Data are provided by the International Telecommunication Union.

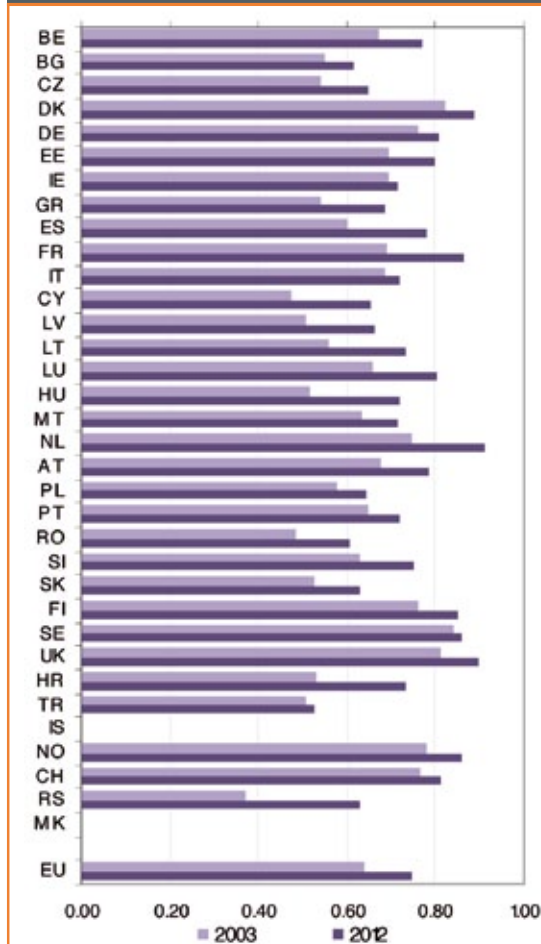
The *human capital index* is obtained by the weighted average of two indicators: the adult literacy rate and the gross enrolment ratio (combining the primary, secondary and tertiary levels). The adult literacy ratio has a two third weight, while the gross enrolment ratio one third. The data for the human capital index indicators are obtained from UNESCO and completed with information from UNDP's Human Development Report, UNICEF and the World Bank.

Source: Statistical Annex UNPAN E-Gove 2012 Survey

²⁴ UNPAN, Global E-government survey 2012, Statistical Annex

²⁵ See UNPAN, E-Government Development, http://www2.unpan.org/egovkb/egovernment_overview/ereadiness.htm

Figure 14: E-Government Development Index



Source: UNPAN, UN e-Government Survey 2003 and 2012

The ranking of the countries is done relative to each other, as the EGDI index does not represent an absolute value, all the values of the composing indexes are normalized (i.e. subtracting the lowest score from the respective country's score and dividing the result by the range of total score values for all countries).

Pitfalls of the approach

- The value of the EGDI index is used to rank the UN MS e-government performance on a numerical scale, but the changes in ranking may not reflect the changes in "sophistication" of the e-government programmes.
- The meaning of the values of the EGDI index varies from one survey to the other, due to changes in understanding the concept of e-government. This makes the survey results less comparable from one year to the other.
- The challenges in assessing the online services index include the selection of the appropriate site/ URL at the national level, identifying ministerial websites, language limitations, data quality issues.

Large changes in EU12 – Nordic countries and Netherlands best performers

When comparing the trends of the development of e-government during the past years, it seems that most of the EU27 Member States have made improvements (Figure 14).

The biggest upward shifts in providing public services through the use of ICT in the period of 2003-2012 happened in Cyprus, France, Lithuania, Netherlands, Spain and Serbia.

Top performers are, nonetheless, the Netherlands and further Nordic countries such as Denmark, Sweden and Norway, with scores of over 0.87. The New Member States strike with a mild catch-up rate since 2003, with Romania, Bulgaria and Slovakia and Latvia obtaining similar scores ranging around 0.6 in 2012 (rising from around 0.5 in 2003). The most successful New Member States are Estonia (0.79) and Slovenia (0.75) in 2012.

2.1. Capacities (Activities)

Indicator 2.1.1 Share of service innovators that innovate in-house

Key findings

- The EU27 share of public sector in-house innovation is high at 64% - higher than the share of SMEs innovating in-house.
- Large organisations have higher shares of in-house service innovators than small ones (83% vs. 58%).

Methodology

The indicator is comparable to the IUS indicator “SMEs innovating in-house” and captures public administration organisations using in-house innovation capabilities. Organisations with in-house innovation capabilities should be in a better position to respond to requests for change initiated at higher hierarchical levels or by customers. Having in-house capabilities should also ensure more continuous innovation activities as innovation will also be internally triggered and not only respond to external requests for change.

The indicator is constructed using Innobarometer 2010 data. The relevant question asked:

Were any of [your] new or significantly improved services developed by?

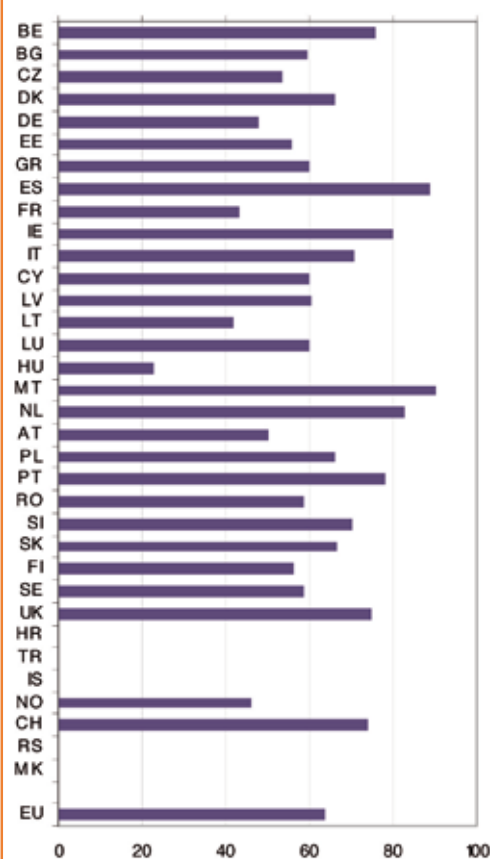
- Your organisation together with other public sector organisations, including regional or national affiliates of your organisation;
- Your organisation together with private businesses;
- Your organisation together with not-for-profit organisations;
- Your organisation by itself;
- Other organisations or businesses, with your organisations making no further changes or only minimal changes.

The indicator is constructed by calculating the share of respondents who said ‘Yes’ to any of the questions a to d.

Share of public sector innovation higher than in private sector

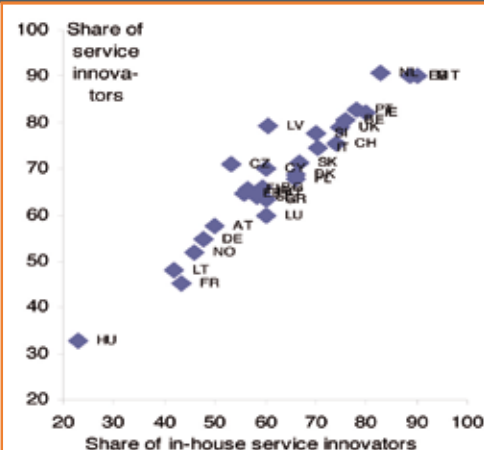
The EU27 share of in-house innovators is high at 64% and much higher than the share of SMEs innovating in-house (30.3% using CIS 2008 data, cf. IUS 2011). Besides differences between private sector and public sector innovation, the organisational size explains part of this difference as the indicator includes all public administration organisations whereas the IUS indicator excludes large firms (Figure 15).

Figure 15: Share of service innovators innovating in-house



Source: Innobarometer 2010

Figure 16: Share of service and in-house innovators



Source: Innobarometer 2010

A split of the public administration organisations between small (those with less than 250 employees) and large (those with 250 or more employees) organisations shows that the share of in-house service innovators is smaller for small organisations (58%) than for large organisations (83%) (European Commission, 2011).

The share of in-house service innovators is high in Malta (90%), Netherlands (83%) and Spain (89%) and lowest in Hungary (23%). Countries with higher shares of in-house innovators also have higher shares of service innovators (Figure 16).

Indicator 2.1.2 Share of process innovators that innovate in-house

Key findings

The EU27 share of in-house process innovators is high at 76%, with Denmark being the EU leader.

Methodology

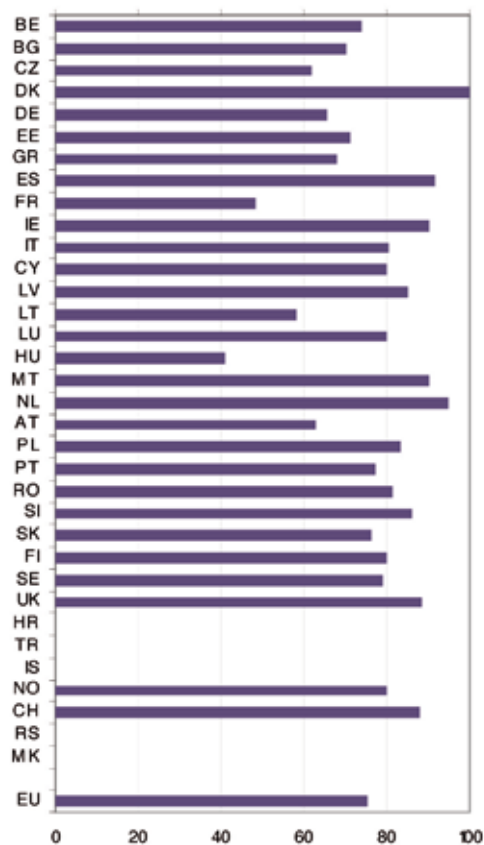
Similar to the indicator on in-house service innovators, this indicator captures the share of public administration organisations using in-house innovation capabilities to develop innovative processes or organisational methods.

The indicator is constructed using Innobarometer 2010 data. The relevant question asked:

Were any of [your] new or significantly improved processes or organisational methods developed by:

- a) Your organisation together with other public sector organisations, including regional or national affiliates of your organisation
- b) Your organisation together with private businesses
- c) Your organisation together with not-for-profit organisations
- d) Your organisation by itself
- e) Other organisations or businesses, with your organisations making no further changes or only minimal changes

Figure 17: Share of process innovators innovating in-house



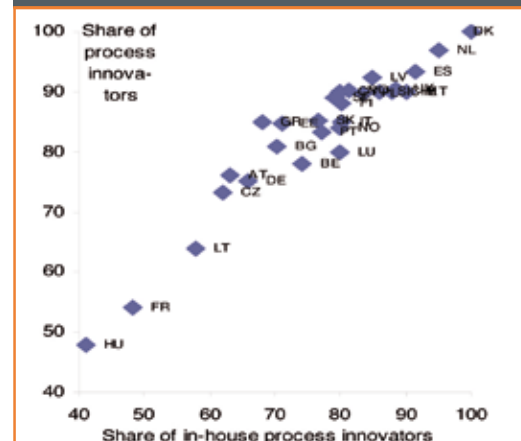
Source: Innobarometer 2010

The indicator is constructed by calculating the share of respondents who said 'Yes' to either question a to d.

More in-house innovation in large organisations

The EU27 share of in-house innovators is high at 76% with a smaller share for smaller (71%) than for large organisations (92%) (Figure 17). The share of in-house service innovators is high (90% or more) in Denmark, Netherlands and Spain and low (below 50%) in France and Hungary. Countries with higher shares of in-house innovators also have higher shares of service innovators (Figure 18).

Figure 18: Share of process and in-house innovators



Source: Innobarometer 2010

2.2. Drivers and barriers (Activities)

Indicator 2.2.1 Importance of internal barriers to innovation

Key findings

- Internal barriers to innovation are considered as highly important by 30% of public administration organisations in the EU27.
- Internal barriers to innovation are perceived as being very high in Belgium, Bulgaria, and Poland.

Background

Drivers and barriers of public sector innovation are not systematically collected or can be estimated via proxy indicators. Thus, the only available information source is the Innobarometer 2010.

Methodology

The indicator is constructed using data from the Innobarometer 2010. Question 18 asks organisations active in public administration:

Since January 2008, how important were the following factors in preventing or delaying your organization's efforts to develop or introduce new or significantly improved services, communication methods, processes or organisational methods?

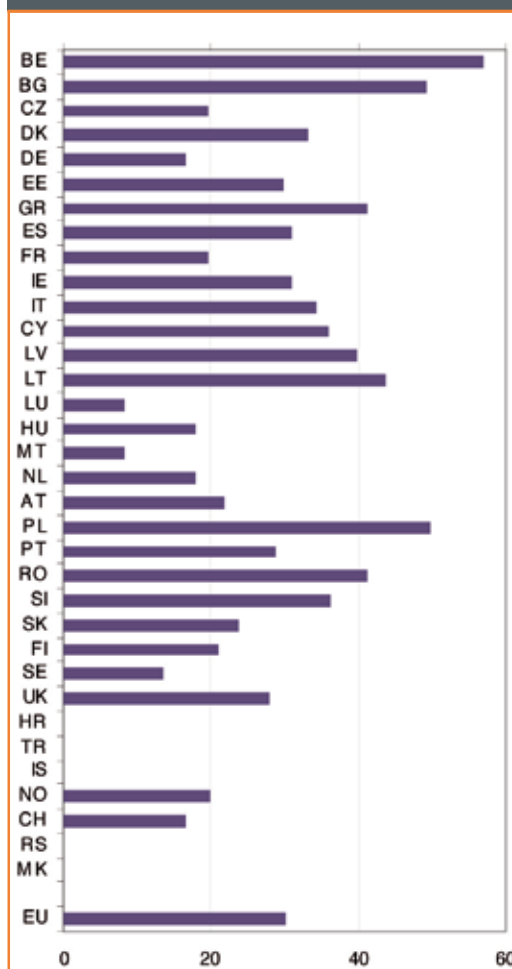
- Lack of management support
- Lack of incentives for your staff
- Staff resistance
- Uncertain acceptance by the users of your services*
- Regulatory requirements*
- Lack of sufficient human or financial resources
- Risk adverse culture in your organisation

The indicator for internal barriers is constructed by calculating the share of 'High importance' to either a), b), c), f) or g).

Internal barriers in several countries still high

Internal barriers to innovation are seen as highly important by 30% of public administration organisations in the EU27 (Figure 19). Internal

Figure 19: Internal barriers to innovation



Source: Innobarometer 2010

barriers are more important in delaying or preventing innovation in several Eastern and Southern European countries including Bulgaria, Lithuania, Poland, Romania and Greece but also Belgium. Internal barriers are least important in more advanced countries as France, Germany, Luxembourg, Netherlands, Norway, Sweden and Switzerland but also in the Czech Republic, Hungary and Malta.

Indicator 2.2.2 Importance of external barriers to innovation

Key findings

External barriers to innovation are seen as highly important by almost 30% of public administration organisations in the EU27.

Methodology

The indicator is constructed using data from the Innobarometer 2010. Question 18 asks organisations active in public administration:

Since January 2008, how important were the following factors in preventing or delaying your organization's efforts to develop or introduce new or significantly improved services, communication methods, processes or organisational methods?

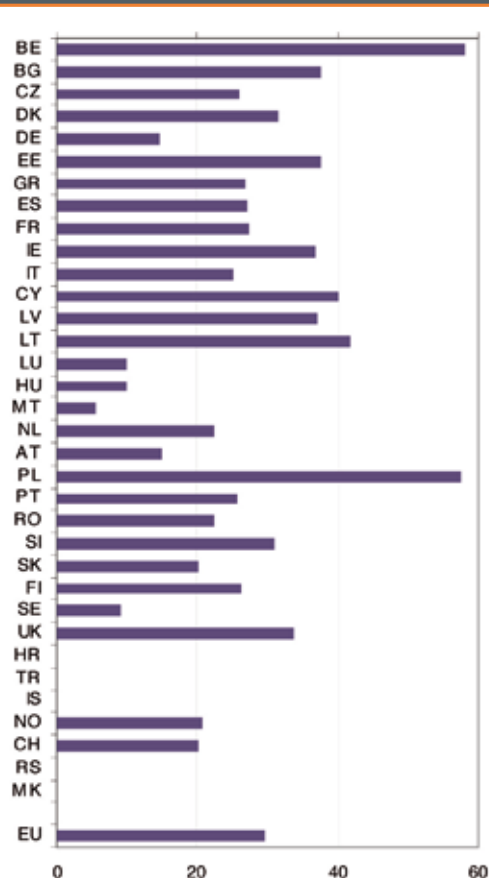
- a) *Lack of management support*
- b) *Lack of incentives for your staff*
- c) *Staff resistance*
- d) *Uncertain acceptance by the users of your services*
- e) *Regulatory requirements*
- f) *Lack of sufficient human or financial resources*
- g) *Risk adverse culture in your organisation*

The indicator for internal barriers is constructed by calculating the share of 'High importance' to either d) or e).

External barriers high in Poland and Belgium

External barriers to innovation are seen as highly important by almost 30% of public administration organisations in the EU27, the same percentage as for internal barriers (Figure 20). External barriers are more important in delaying or preventing innovation in Belgium and Poland. External barriers are perceived as least important in Austria, Germany, Hungary, Luxembourg, Malta and Sweden.

Figure 20: External barriers to innovation



Source: Innobarometer 2010

Indicator 2.2.3 Active management involvement in innovation**Key findings**

- Management is active in promoting innovation in on average 41% of public administration organisations in the EU27.
- The second method, used by 34% of the agencies, is characterised by a 'bottom up' approach to innovation.

Methodology

The indicator is constructed using a combination of data from the Innobarometer 2010 addressing active organisations in public administration.

Question 14 asked:

Since January 2008, how important were the following information sources for the development of your innovations?

- Ideas from management
- Ideas from staff
- Examples of best practice by another government organisation
- Professional organisations
- Visits to conferences
- Enterprises as suppliers
- Enterprises as clients or users
- Citizens as clients or users

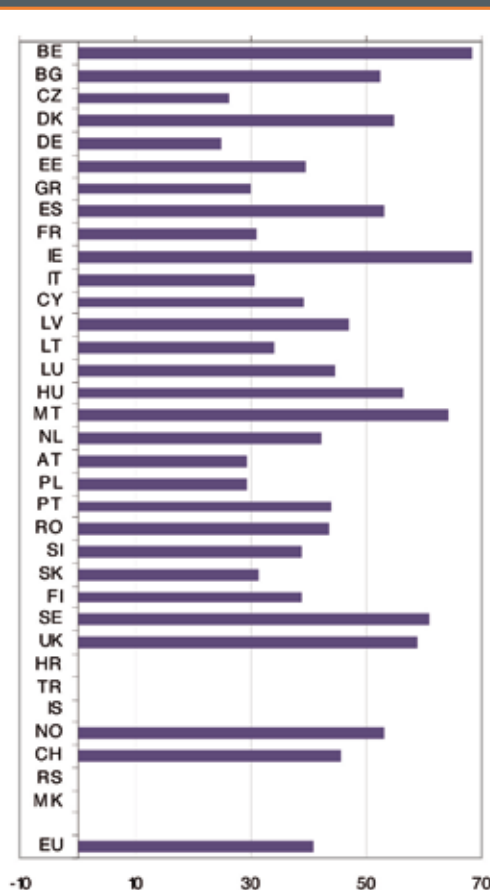
Question 17 asked:

How well does the following apply to your organisation since January 2008?

- Managers support trial-and-error testing of new ideas
- Managers take an active role in developing and implementing innovations
- Staff have incentives to think of new ideas and take part in their development
- Users are involved in the design or planning of new or improved services
- New or improved services are evaluated after completion

The indicator on active management involvements is calculated as the share of 'High' responses to Question 14a) or 'Fully' responses to either Question 17a) or Question 17b).

Figure 21: Active management involvement in innovation



Source: Innobarometer 2010

An analysis of the Innobarometer 2010 showed that management involvement was one of five factors identifying three different innovation strategies or methods that European public sector agencies use to innovate (Arundel and Hollanders, 2011). The first, used by 30% of the responding agencies, consists of a *policy driven approach* to innovation, with innovation implemented in response to mandated changes in the agency budget, new laws or regulations, new policy priorities, or the mandated introduction of new services.

The second method, used by 34% of the agencies, is characterised by a *'bottom up' approach* to innovation and is the opposite of the policy driven approach. Bottom up innovators have active management support for innovation and have implemented policies to encourage

the development of innovative ideas and tests of their efficacy. The third method, *external knowledge* innovators, is used by 35% of the agencies. These agencies report high levels of barriers to innovation and seek to overcome them by drawing on sources outside of the agency for assistance with developing an innovation.

Management is active in promoting innovation in on average 41% of public administration organisations in the EU27 (Figure 21). In particular in Belgium, Ireland and Malta management takes an active role whereas in Czech Republic and Germany management is relatively inactive.

Indicator 2.2.4 Importance of external knowledge

Key findings

- External knowledge is an important driver for innovation in 26.5% of EU27 public administration.
- Belgium (53%) and Bulgaria (42%) rely the most on external knowledge as opposed to Finland (15%), Italy (13%) and Norway (13%).

Background

The indicator measures the importance of external knowledge sources in innovation. Arundel and Hollanders (2011) in their analysis of the Innobarometer 2010 showed that external knowledge sources was one of 5 factors identifying 3 different innovation strategies or methods that European public sector agencies use to innovate.

In an era of 'Open Innovation,' all things being equal, more innovative organisations will make more and better use of external knowledge in order to innovate. With this logic, one can argue that a country where public agencies/administrations make widespread and substantial use of external knowledge is likely to have a more innovative/stronger public sector in the long run.

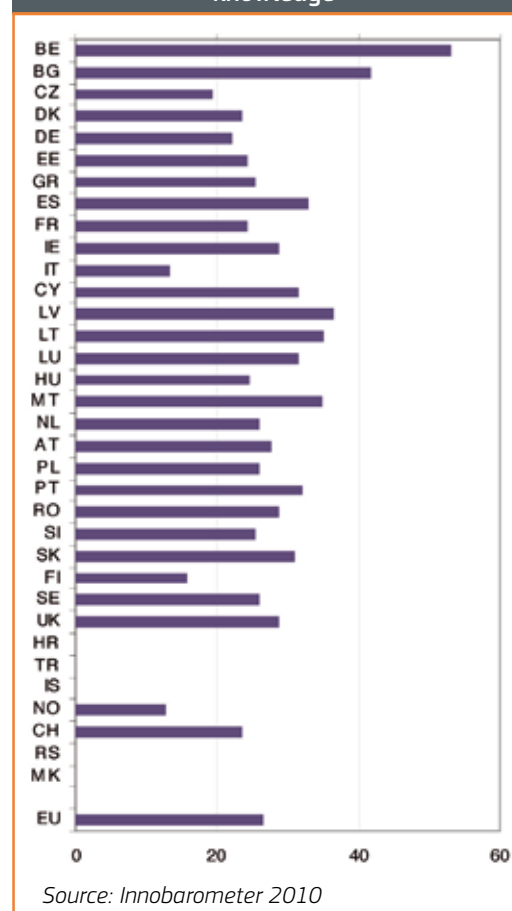
Methodology

The indicator is constructed using data from the Innobarometer 2010. Question 14 asks organisations active in public administration:

Since January 2008, how important were the following information sources for the development of your innovations?

- Ideas from management*
- Ideas from staff*
- Examples of best practice by another government organisation
- Professional organisations
- Visits to conferences
- Enterprises as suppliers
- Enterprises as clients or users
- Citizens as clients or users

Figure 22: Importance of external knowledge



The indicator is calculated as the share of 'High' responses to either c) to h).

External knowledge is an important driver for innovation in 26.5% of EU27 public administration and seems of lesser importance than active management involvement (Figure 22). Countries where public administration relies more on external knowledge include Belgium (53%) and Bulgaria (42%). In Finland (15%), Italy (13%) and Norway (13%) external knowledge is of lesser importance for the development of innovation.

Indicator 2.2.5 Share of employees involved in groups that meet regularly to develop innovations**Key findings**

- In 22% of public administration organisations staff meet regularly to develop innovations.
- The highest amount of group work happens in Sweden's public administration (52% of employees), as opposed to Hungary (6%).

Methodology

Employees more involved in groups discussing or developing innovations will have more positive attitudes to innovation. The indicator is constructed using data from the Innobarometer 2010. Question 9 asks organisations active in public administration:

What percent of your employees are currently involved in groups that meet regularly to develop new or significantly improved services, communication methods, processes or organisational methods?

Provided answer categories were: None / Less than 25% / Between 25% and 49% / Between 50% and 74% / 75% or more / [DK/NA]

As precise percentages are not available, the indicator is constructed by applying weights to the responses to the different answer categories:

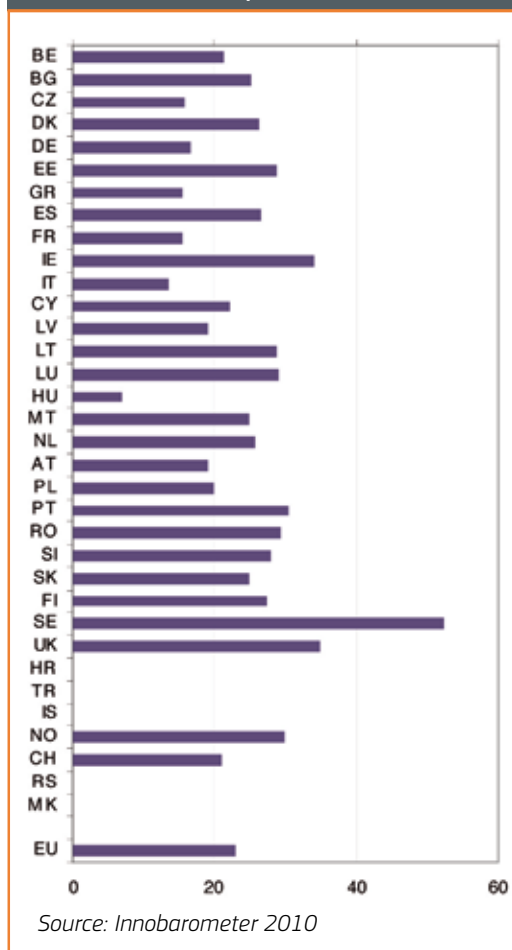
Share of employees involved in groups that meet regularly to develop innovations =

$$(0 * [\text{none}] + .1255 * [\text{less than 25\%}] + .37 * [\text{share between 25\% and 49\%}] + .62 * [\text{share between 50\% and 74\%}] + .875 * [\text{75\% or more}]) / 100$$

where the shares are taken to be halfway the lower and upper limits of the answer categories. Percentage shares are calculated excluding the [DK/NA] responses.

In 22% of public administration organisations staff meet regularly to develop innovations. The differences between the different countries are small except for Sweden where in 52% of organisations staff meet regularly and Hungary where in only 6% of organisations staff meet regularly to develop innovation (Figure 23).

Figure 23: Share of employees involved in groups that meet regularly to develop innovations



3.1. Innovators (Outputs)

Indicator 3.1.1 Share of organizations in public administration with services, communication, process or organizational innovations

Key findings

- The EU average amount of public administrations that innovate in services, communication, process or organizational matters is of 90% per EU Member State.
- The majority MS introduced new or improved services (66%).

Methodology

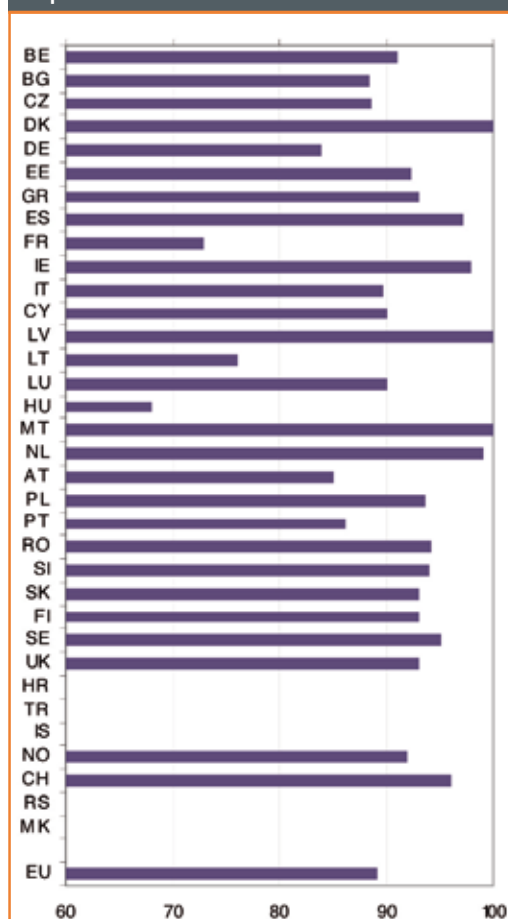
Higher shares of organizations that innovate reflect a higher level of innovative activities within public administration. The indicator is constructed from data resulting from the Innobarometer survey 2010.

This indicator results from calculating the share of organisations in the survey that have introduced new or significantly improved services, new methods of communicating their activities to the public, new processes, or organisational methods since January 2008.

The methods of communication that were considered new or significantly improved in the survey could be related to new ways of promoting the organisation or its services, new modalities of influencing the behaviour of users, citizens, or others, as well as first time commercialization of services or goods. The processes or organizational methods that were taken into consideration in the survey with a potential to be improved were very diverse, relating to:

- Methods of providing services or interacting with users;
- Delivery or logistics systems for the organizations' inputs;
- Improved support activities such as maintenance or accounting systems, as well as;
- Management systems or;
- Methods of organizing work responsibilities or decision making.

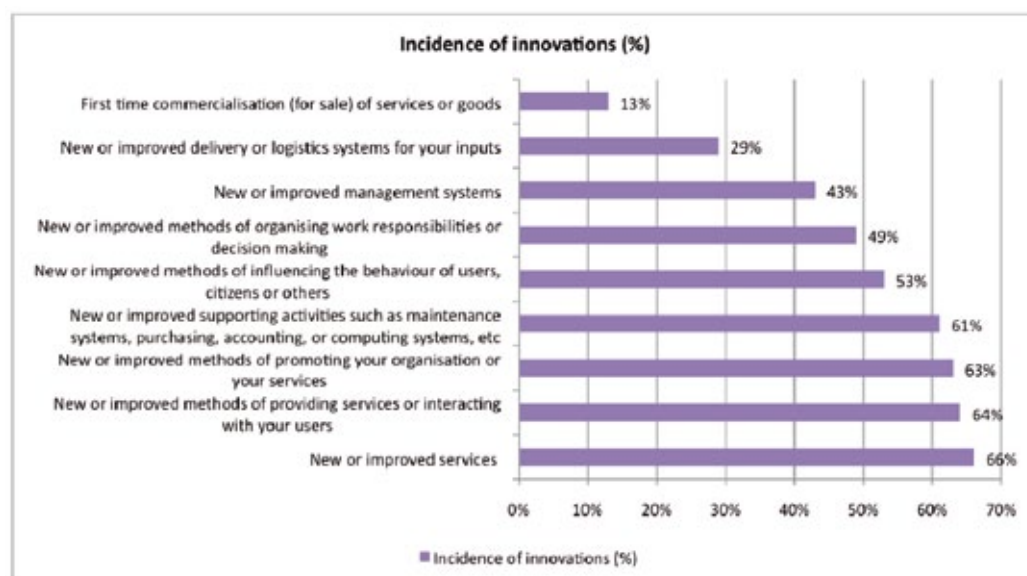
Figure 24: Share of organizations in public administration with innovations



Source: Innobarometer 2010

Service innovations high

It is striking that the EU average share of public administrations that innovate in the sense described above is of almost 90% per EU Member State. There are several countries where virtually all public administrations introduced changes in their processes, services or organization in 2008-2010 (Denmark, Latvia and Malta). The less active countries seem to be Hungary (with 68% innovating public administrations), France (72%) and Lithuania (74%) (Figure 24).

Figure 25: Incidence of innovations in public administrations, by type (%)

Source: Innobarometer 2010

Taking a closer look at the types of innovations that were introduced by the public administrations included in the survey, the majority were mentioning the introduction of new or improved services (66%), as well as new or improved methods of providing services or interacting with users (64%). The incidence of a first time sale of services or goods is the type of

innovation that occurs the least among the surveyed organisations, with only 13% mentioning this as an innovation (Figure 25). It is also interesting to note that 43% of the organisations had introduced new or improved management systems, while 49% introduced new or improved methods of organising work responsibilities and decision-making.

Indicator 3.1.2 Share of 'New' services out of all services innovations

Key findings

- On average, 27% of the services introduced by the organizations were new at the level of EU27.
- The highest share of new services introduced by public administrations recently was in Cyprus (57.1%).

Methodology

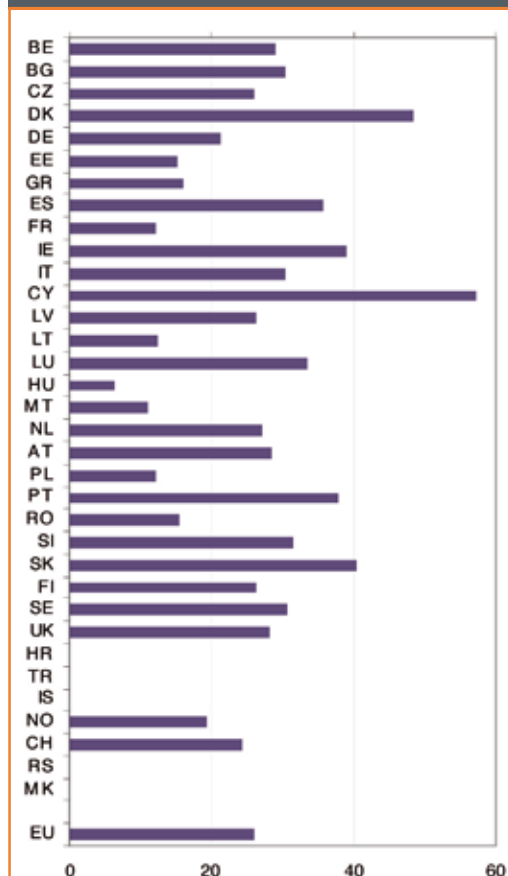
This indicator measures the share of new or significantly improved services introduced by the public administrations since January 2008. It captures both the creation of state-of-the-art technologies (new to national market services) and the diffusion of these technologies (new to organization services). The

indicator would be comparable to the widely used indicator measuring the sales share of new-to-market innovations for firms.

The indicator is constructed based on the answers that public administrations gave to two questions in the Innobarometer 2010. They were asked whether the organizations introduced any new or significantly improved services since January 2008, and whether any of these service improvements were new to the public administration in the respective country or only new to that respective organization. The indicator was constructed by calculating the share of "new" services out of all new or significantly improved services.

The amount of new services introduced in the EU27 Member States varies greatly. On average, 27% of the services introduced by the organizations were new at the level of EU27, surpassing those in Norway (19.2%) and Switzerland (24.3%) (Figure 26). The most services introduced by public administrations recently were in Cyprus (57.1% of services were new), Denmark (48.5%) and Slovakia (43%). At the opposing end of the scale is Hungary, with the least number of new services introduced (only 6.3%), followed by Malta (11.1%) and France (12.2%). It is interesting to note that in terms of the shares of new services introduced, there is a wide variation within the group of old member states and there is one between the two groups. Averages for EU15 and EU12 are 29.6% and 23.7% respectively.

Figure 26: Share of 'New' services out of all service innovations



Source: Innobarometer 2010

Indicator 3.1.3 Public Sector Productivity

Key findings

- Public sector productivity compares the volume of inputs into government activities relative to the volume of government outputs.
- It can become a useful measure of the effect of public sector innovations.
- In order to construct the composite indicator, more efforts need to be made to provide comprehensive data on government outputs at EU level and better conceptualize the measurement methods.

Background

Public sector productivity is an indicator measuring government's performance by comparing the volume of inputs into government activities to the volume of government outputs (accounting for price changes and pay). In addition, the measurement of outputs needs to also take into account the quality of the services provided, giving an indication on how the outputs contribute to achieving outcome targets (Atkinson, 2005). The idea of public sector productivity is not only closely related to the concept of the performance of governments in providing public services, but also to the notion of quality of government and obtaining value for (public) money (OECD, 2009).

Innovation is one factor that is generally considered to drive productivity in organizations (among others). The public sector productivity indicator may therefore shed light on the effects of innovation on the performance of the government sector, which is why the EPSIS project takes it into consideration.

Until recently, the internationally agreed approach was to consider the public expenditures and non-financial resources of governments (e.g. staff numbers) as inputs into government activities, and generally use them as a proxy for outputs. This is also due to the difficulty in associating government output with market values (e.g. health and education services), or to the fact that some government outputs are hardly tangible (e.g. Defence policy and External Affairs).²⁶ Recently, the European Commission brought clarity to the underlying principles of measuring prices and volumes of government services²⁷ and dismissed the practice of measuring outputs based on the inputs in 2006. Since then, several governments have been developing their systems of measuring outputs (for instance in the United Kingdom and Denmark), but data availability is scarce in most Member States at the moment.

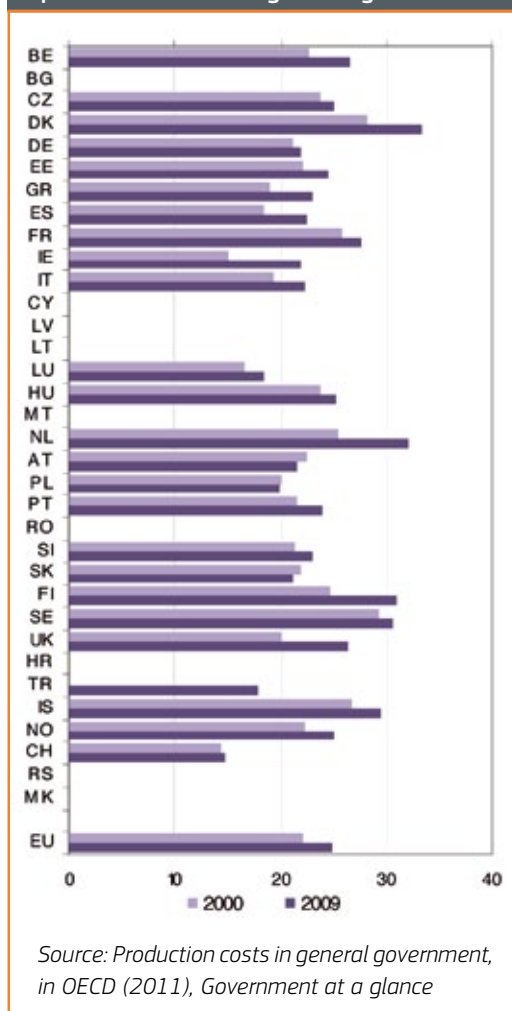
It is important to clarify the concept of government outputs and distinguish it from government outcomes. Outputs are measures of immediate results of government actions, whereas outcomes are measures of long-term results (usually taking the form of overarching policy goals). Outputs are products and services delivered by the public administration, which differ by sectors, ranging from the number of patients treated in a hospital, to licenses, grants, number of school lessons, or prison sentences. Given the differentiated availability of data on public sector outputs across the EU, and the methodological problems of constructing a composite indicator for the public sector productivity, there is no aggregate indicator available at the EU level. There is a need for a more comprehensive measurement and conceptualization of public sector outputs and public sector productivity.

Methodology

The only relevant cross-country data available at an aggregate level can be attributed to the inputs side in calculating the public sector productivity. The data show production costs in general government.

The System of National Accounts defines a classification of public expenditures that lists the production costs

Figure 27: Government inputs – production costs in general government



Source: Production costs in general government, in OECD (2011), Government at a glance

calculation methodology. According to the latter, the government production costs include the compensation costs of general government employees, costs of goods and services produced by non-government entities paid for by the government (including procurement of intermediate products such as accounting or information technology services), and social transfers in kind via market producers. Consumption of fixed capital also counts as a production cost for the government (OECD, 2011). Data for production costs are only provided for OECD countries.

Overall, the EU27 raised its production costs from 2000-2009, a trend shared by most countries covered but Austria, Poland, and Slovakia (Figure 27).

²⁶ Atkinson Review, 2005.

²⁷ Commission Decision of 17 December 2002 further clarifying Annex A to Council Regulation (EC) No 2223/96 as concerns the principles for measuring prices and volumes in national accounts.

3.2. Effects on business performance (Outputs)

Indicator 3.2.1 Improvements in public services for business

Key findings

- Almost 20% of EU27 companies say that public services for business have improved.
- 56% of companies say that these services have remained the same and 24% say that they became worse.

Methodology

Gathering subjective data from user / beneficiary community is a good check on the extent to which new services are really innovative and represent a material improvement. This user perspective is a natural complement to the objective data on innovation inputs and activities and subjective opinions of the public administrations themselves. The source of the information is Innobarometer 2011, which asked private companies:

Based on your experience, have public services for businesses generally improved over the past three years?

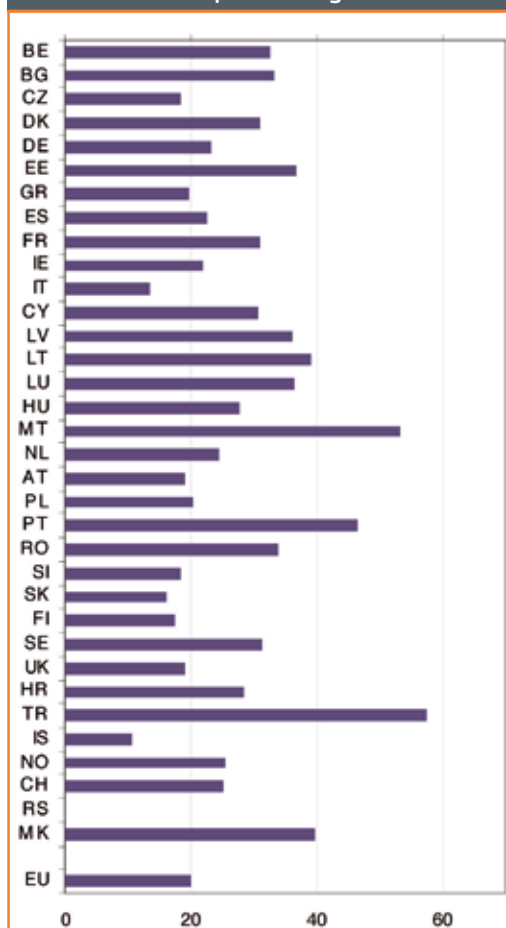
Perceived improvements low

Almost one out of five (20%) EU27 companies say that public services for business have improved whereas 56% say that these services have remained the same and 24% say that they became worse. Most favourite opinions are found in Turkey (57%), Malta (53%) and Portugal (47%), whereas less than 15% of responding firms in Iceland and Italy say that public services have improved (Figure 28).

The results seem to indicate that improvements in public services either are relatively scarce or are not perceived as such by the business sector as one would expect that over a three-year period public services should have improved for more firms than the reported 20%.

It could also be that in several countries the quality of public services is already very high such that either further improvements are not needed or that such improvements are small and will therefore not be noticed. For a possible future Innobarometer an additional question should be added asking firms about the general level of public services, e.g. if these are already of very high, high, average, low or very low quality.

Figure 28: Public services for business have improved in general



Source: Innobarometer 2011

Indicator 3.2.2 Impact of innovative public services on businesses**Key findings**

- Only 15% of EU27 firms say that innovative public services have had a significant impact on their performance.
- A positive impact of innovative public services for firms in Portugal (35%) and Turkey (48%).

Background

While a public sector inquiry is best placed to identify and gauge any innovation-driven efficiency gains realised within the public sector itself, a very substantial motivation for public sector innovation is the improved service quality or reduced burden the government places on business. Thus for this indicator a business sector view is taken.

Methodology

An indicator is constructed using data from 3 questions from the Innobarometer 2011. Question 5 asked firms:

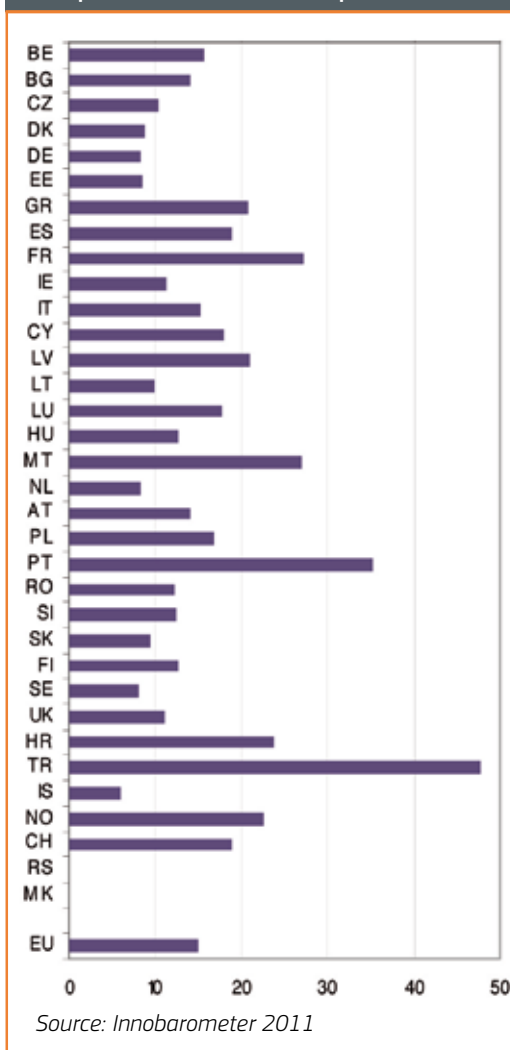
Based on your experience of using public services for businesses, since January 2009, have you observed the introduction of any of the following...?

- Option to complete government forms over the internet;
- Reduction in the time and effort needed for your company to complete government forms;
- Access to information on government services over the internet;
- Reduction in the time required for permits or licenses;
- Faster response time for other government services;
- Reduction in financial costs to your company.

Question 6 asked firms for each of the options for which they answered 'Yes' in Question 5 about the level of significance. If for at least one service a 'Significant improvement' was received in Question 6, firms were asked (Question 7):

To the best of your knowledge, was the improvement of the public services for businesses due to an innovation, that is to say a new or significantly improved service?

Figure 29: Introduction of innovative public services for business have had a significant impact on their business performance



The indicator is constructed by calculating the share of at least one 'Yes' to Q5 and 'Significantly improved' to Q6 and 'Yes' to Q7 out of all responses.

Only 15% of EU27 firms say that innovative public services have had a significant impact on their performance. In particular in Portugal and Turkey large shares of firms report a positive impact of innovative public services, but in Denmark, Estonia, Germany, Iceland, Netherlands and Sweden these shares are below 10% (Figure 29).

3.3. Government procurement (Outputs)

Indicator 3.3.1 Government procurement as a driver of business innovation

Key findings

Almost 24% of companies in the EU27 have sold their innovations to the public sector since 2009.

Background

The public sector has been an important driver of innovation in the private sector through its role as a 'lead market' and its outsourcing of aspects of its own technological development requirements (from satellite navigation to congestion charging systems).²⁸

A public sector client is typically a large, highly organized and sophisticated customer (or group of customers) that can benefit from and cope with purchasing novel, prototypical goods and services. There is a growing commitment throughout the EU to more fully exploit these special qualities and thereby boost public sector performance and private sector innovation and spillovers.²⁹

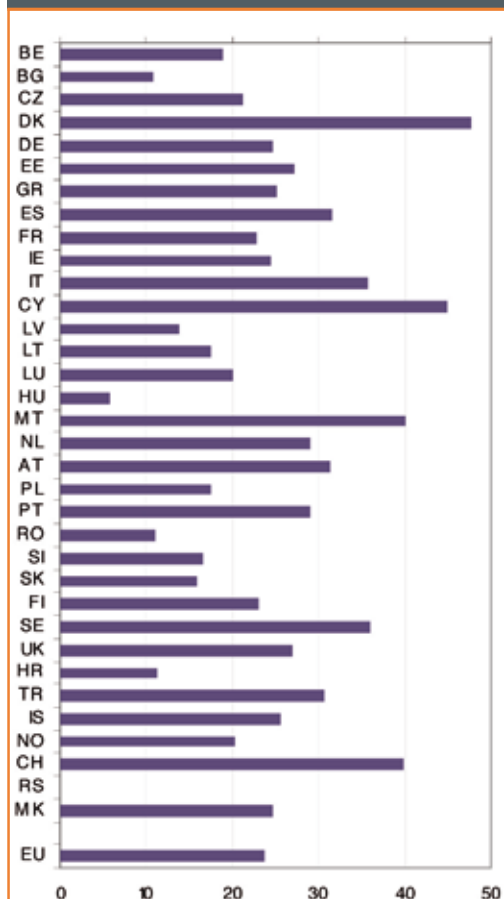
Moreover, the public sector constitutes a large and important market for goods and services, at around 15-20% of GDP, which represents a market for a significant proportion of all businesses. That said, the majority of small firms and micro-enterprises (so the very great majority of all firms) may not be well placed to benefit from such opportunities.

Methodology

The indicator is derived from the Innobarometer 2011 survey. It is calculated as the share of companies that answer with 'Yes' to the question whether their public procurement activities have included the possibility to sell one of their innovations to the government (i.e. new or significantly improved products or services) since January 2009.

The results of the Innobarometer 2011 show that on average almost 24% of companies in the EU27 have sold their innovations to the public sector since 2009. The countries with the largest public procurement of innovations are Denmark (48% of companies), Cyprus (45%) and Malta (40%). In contrast, Hungary has the smallest share of companies that sold their innovation to the public sector (6% of all companies) (Figure 30).

Figure 30: Government procurement as a driver of business innovation



Source: Innobarometer 2011

²⁸ A selection of cases has been compiled by the project UNDERPIN, which can be found at <http://underpin.portals.mbs.ac.uk>

²⁹ European Commission (2008), *Pre-commercial procurement: Driving innovation to ensure high quality public services in Europe*, Office for Official Publications of the European Communities.

Indicator 3.3.2 Government procurement of advanced technology products**Key findings**

In the EU, government procurement is believed to be on average fostering technological innovation at a moderate level (with a score of 3.8 out of 7 points).

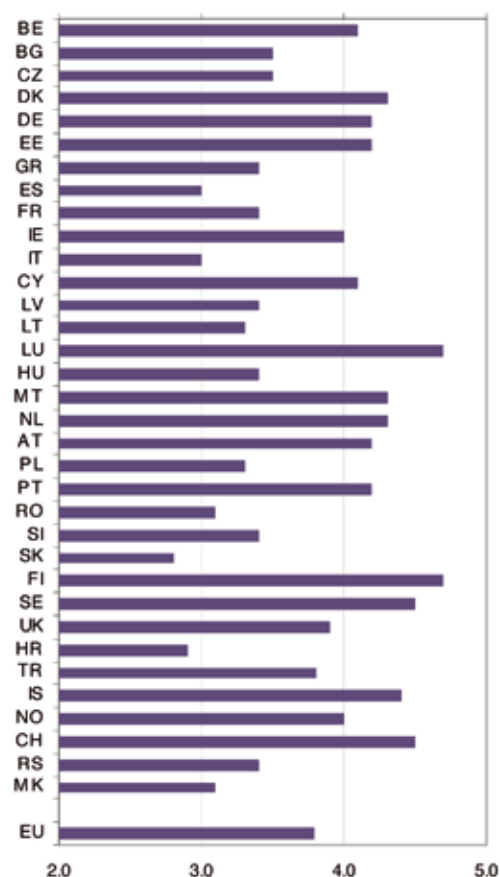
Methodology

Government procurement can lead to innovation in the private sector, as noted in the preceding indicator.

The World Economic Forum (WEF) already gathers and publishes a government procurement metric covering all EU member states, among other countries. Here the WEF is asking business leaders if their national government procurement decisions foster technological innovation.

The WEF Global Executive Survey results show that the businesses which considered the government procurement decisions as fostering technological innovations were in particular in Luxembourg, Finland (scores of 4.7 on a scale of 1-7) and Sweden (score of 4.5) (Figure 31). On the other hand, only a few of the businesses in Slovakia (score of 2.8), Italy and Greece (scores of 3) believe that the government procurement decisions are fostering technological innovation.

Figure 31: Government procurement of advanced technology products



Source: World Economic Forum, Global Competitiveness Report

Indicator 3.3.3 Importance of innovation in procurement**Key findings**

- For the majority of public administration organisations (66%) innovation and low cost are equally important.
- For only 12% innovation is more important than low cost whereas for 22% low cost is more important than innovation.

Methodology

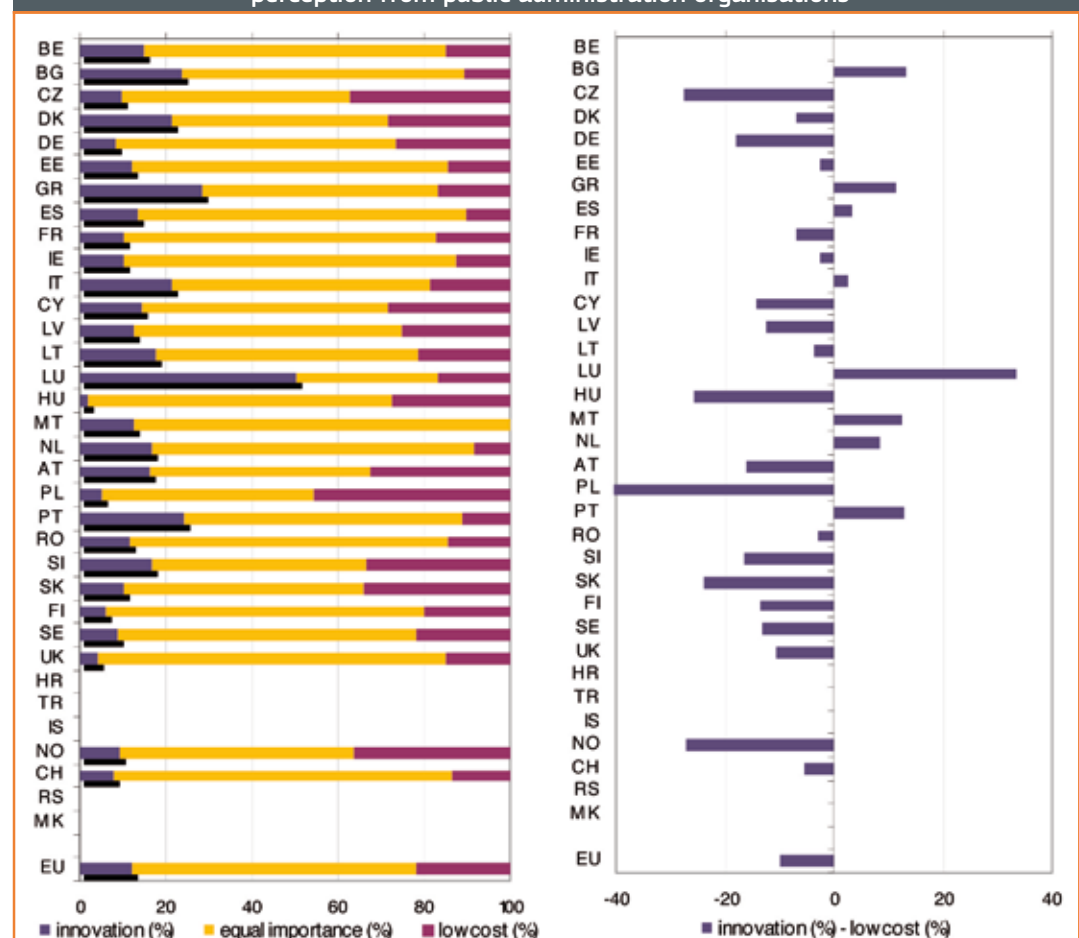
Governments can promote innovation through their tendering specifications (also cf. Indicator 3.3.1). Both the Innobarometer 2010 and 2011 include questions on the perception whether innovation or cost is more important for winning a tender. The Innobarometer 2010 results provide a snapshot

of the perception among public administration organisations about the relative importance of innovation.

For the majority of organisations (66%) innovation and low cost are equally important, for only 12% innovation is more important than low cost

whereas for 22% low cost is more important than innovation (Figure 32). Only in Bulgaria, Greece, Italy, Luxembourg, Malta, Netherlands and Spain the share of organisations stating that innovation is more important is larger than those stating that low cost is more important.

Figure 32: Importance of innovation for winning procurement tenders – perception from public administration organisations

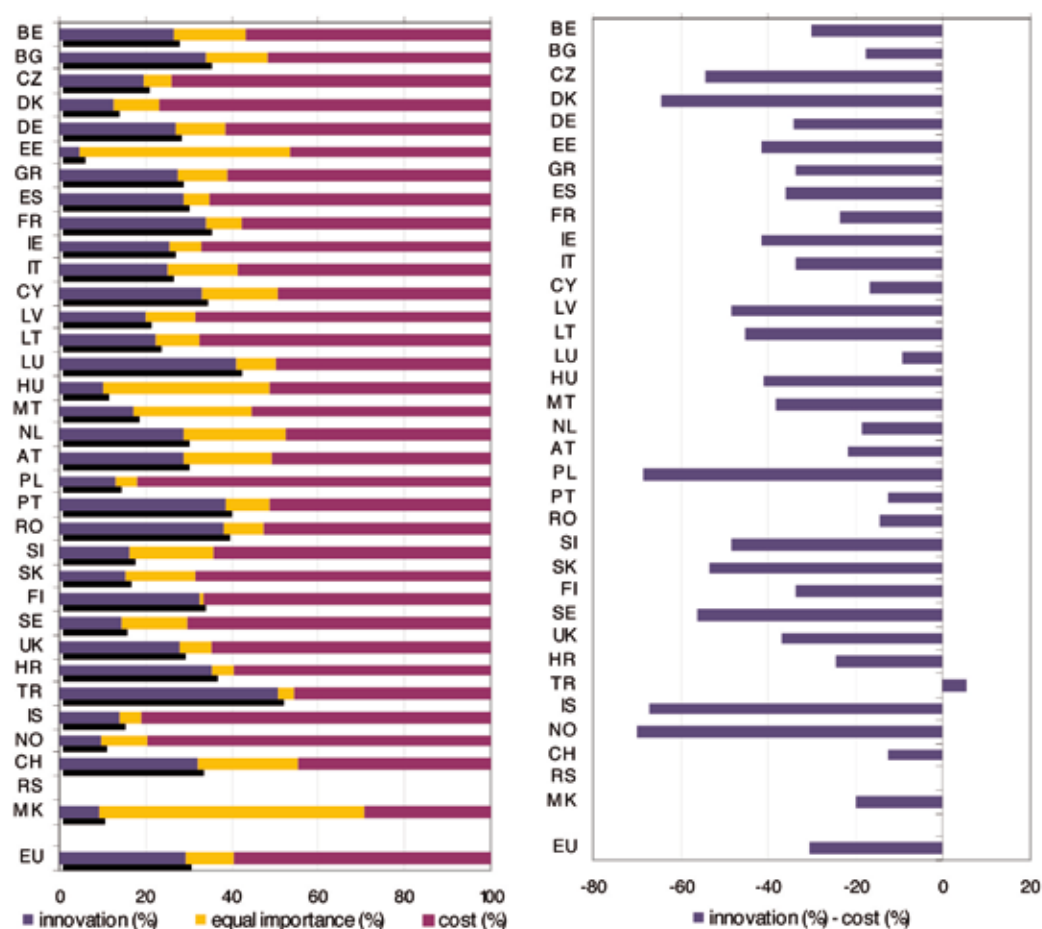


Source: Innobarometer 2010

The Innobarometer 2011 addresses a similar question to firms for both goods and services. Companies hold a less optimistic view about the importance of innovation in winning a public tender. For winning a public tender for goods 60% state that low cost is more important, 11% see cost and innovation as being of equal importance and 29% see innovation as being more important

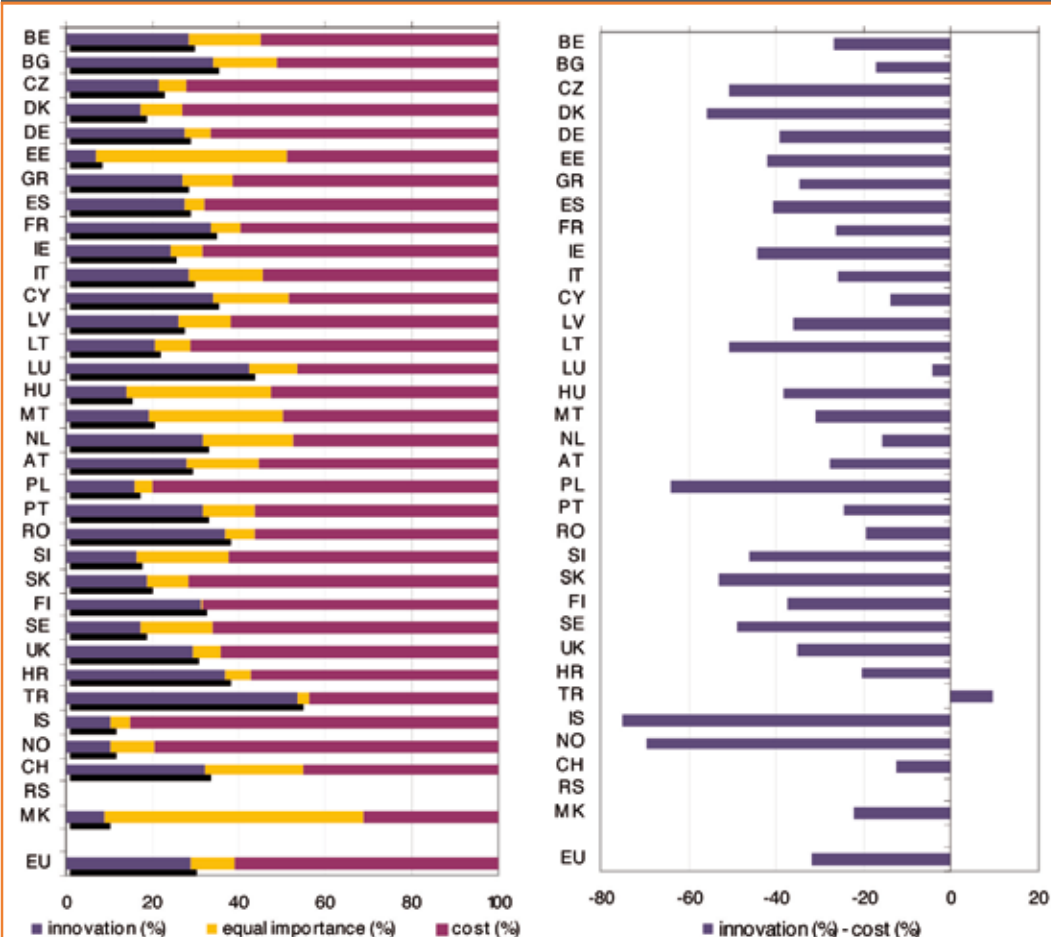
(Figure 33). For winning a public tender in services the results are almost similar: 61% hold low cost as being more important, 10% see the innovation and low cost as equally important and 29% see innovation as being more important (Figure 34). In all countries except Turkey firms think that low cost is more important than innovation for winning a public tender.

Figure 33: Importance of innovation for winning public tender for goods – perception from private firms



Source: Innobarometer 2011

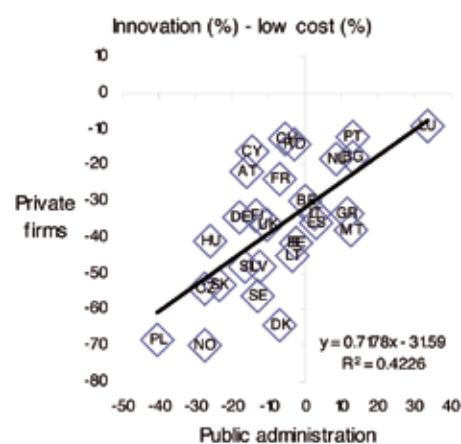
Figure 34: Importance of innovation for winning public tender for services – perception from private firms



Source: Innobarometer 2011

Despite differences in perception between public sector officials and private firms, a closer inspection of the data shows that perceptions within countries are related. In countries where public sector officials have a relatively lower perception of the importance of innovation as compared to officials in other countries also private firms have a lower perception of the importance of innovation as compared to firms in other countries (Figure 35). Perceptions about the importance of innovation are most positive in Bulgaria, Luxembourg, Netherlands and Poland.

Figure 35: Perceptions on the importance of innovation for winning a public tender: public versus private sector



Source: Innobarometer 2010 and 2011

5.2. EPSIS scorecard

The indicators presented in the previous section are used to create a scorecard showing the relative strengths and weaknesses by indicator for each country (Table 7).

Scorecard methodology

The methodology for assigning performance scores for each indicator is simple by using the distribution of the countries' scores to assign a score being either above, close to or below average performance:

- Above average performance is obtained when the indicator score is among the highest 33% of the observed scores for all countries;
- Close to average performance is obtained when the indicator score is among the middle 33% of the observed scores for all countries;
- Below average performance is obtained when the indicator score is among the lowest 33% of the observed scores for all countries.

Above average performance is indicated with a green coloured dot, close to average performance with a yellow coloured dot and below average performance with a red coloured dot. The methodology makes sure that there is an equal distribution of green, yellow and red dots for each indicator. The methodology has been applied to all countries for which data are available for at least 21 of the 22 indicators. Serbia (data for 5 indicators), FYROM (6), Croatia and Iceland (10) and Turkey (11) have not been included in the scorecard.

Scorecard results

The scorecard shows for each country relative performance strengths and weaknesses compared to the other countries. Countries showing an above average performance on 10 or more indicators include Denmark, Luxembourg, Malta, Netherlands, Portugal, Sweden and Switzerland. Countries showing a below average performance on 10 or more indicators include Bulgaria, Czech Republic, Germany, Greece, Hungary, Italy, Lithuania, Poland and Slovakia.

However, due to the different nature of the indicators, with some indicators referring to 'hard' statistical data and other indicators referring to 'soft' opinion-based one should not use the scorecard to assess overall relative performance. The scorecard can be used to identify individual dimensions where relative performance could be improved.

In interpreting the scorecard one should also keep in mind that several of the indicators are opinion based indicators. These indicators might not measure the actual level of e.g. the quality of public services but rather the change in this level. Countries scoring high on these indicators have seen a higher rate of change but this could be the result from having started from a lower level. A high share of firms agreeing with statements like "public services have improved in general" could thus not only indicate a high level of change but also a low level of the quality of such services.

Table 7: EPSIS scorecard

[illegible]

6. Public services as a driver of improved firm performance

The public sector plays an important role in developed countries by contributing to a substantial share of national GDP. By creating a favourable business climate the public sector can also have a profound impact on the economic and innovative performance of firms. Efficient and high quality public services also act as a driver of business performance.

The section estimates the impact of public sector innovation on firm performance. Section 6.1 develops a wider framework for measuring public sector innovation based on government tools and evaluates the existing literature with respect to this framework. Section 6.2 summarizes aggregate findings from the Innobarometer 2011 report (EC, 2012). Section 6.3 uses the Innobarometer 2011 firm-level data to evaluate the impact of public sector innovation testing five hypotheses using different regression techniques.

6.1. Wider framework: Findings from the literature

Public sector innovation is a key contributor to national growth and to the welfare of citizens (Windrum, 2008) yet the literature is scattered across disciplines with respect to the actual measurement of its impact. While traditionally studied in political science and public administration under the concept of policy reforms and policy changes using public opinion polls, economics recently proposed a new terminology as public sector innovation trying to develop more accurate measurement frameworks for its impact.

There has been an extensive research on the public sector particularly in political science, public administration and in economics however most of the available literature has been concerned with policy reforms and policy changes recently termed as public sector innovation. Political science has been concerned primarily with the mechanisms and factors that determine policies and programmes investigating governance, political systems and political regimes, policy change, reforms and decision making mechanisms (Nelson, 2008; Windrum, 2008). Whereas political science is more concerned with the political organization of the state and political decision making (e.g. the legislative function), public administration is more concerned with the study of the executive function of the government including the functions of the courts in administration of justice and the executive functions of all the civilian and the military agencies in providing police and security public services. On the other hand, public administration also has a regulatory function as it formulates rules, regulations and public policies to implement legislation. The public administration

literature is concerned mainly with the organization types and models, the nature of bureaucracies and their effects, reforms in public administration and types of management in public administration. Economics on the other side has been concerned with evaluations of effectiveness and efficiency of implemented or future policies using ex-post and ex-ante evaluation methods and cost-benefit models.

The rationale for government intervention is to realize activities with high social returns that due to certain market failures do not have private returns (Arrow, 1962). Innovation policies and innovations in public sector activities are oriented to address market failures and in particular (Alvarez et al., 2012): “mitigate the “*imperfect private appropriability*” that characterize the production of scientific and technical knowledge (Nelson, 1959; Arrow, 1962); correct *information asymmetries* affecting investment in innovation, which leads to problems in accessing external finance or to slowing down technology diffusion; and facilitate the *coordination* of investments in and access to complementary assets by the different actors involved in the innovation process.”

The main difficulty in measuring the impact of public sector innovation is the diversity of public sector services and policies, diversity of agencies and bodies responsible for the implementation and the diversity of beneficiaries and outcomes.

The multitude of governmental policies and services that have diverse outputs makes it difficult to measure its outcome in a uniformly manner. The government can use a multitude of tools, to solve market and systemic failures, such as: 1) organization and provision of collective/individual goods and services that have high social returns but which due to market failures do not have

private returns (OECD, 2009); 2) organization and/or financing private provision of collective/individual goods and services that have high social returns but which due to market failures do not have private returns (via incentives to organize and coordinate privately, procurement); 3) collective/individual support via financial cash transfers, subsidies or tax credits, or counselling and advice provision for particular groups of individuals or firms (OECD, 2009); 4) revenue generation and collection (tax system, public enterprises); 5) regulations; 6) policies; and 7) information provision.

These tools can be grouped in government tasks: public demand, public supply, stimulating private demand, public financing, public information, public administration, public order and safety and state defence. These tools have behavioural effects since they provide behavioural incentives and the targeted groups can endorse or block certain reforms. Public administration offers the state the bureaucratic apparatus that enables the provision of goods and services and the organization and implementation of policies. In addition to public administration, there are other agencies, organizations, courts and police establishments, in charge of service provision.

Public sector innovation can occur at different levels: innovations in public administration and organization of public sector establishments, policy and regulations innovations (reforms), innovations in public campaigns and public information dissemination, innovations in revenue collection and generation (tax system, public enterprises), innovations in service and goods delivery (such as education, public knowledge/R&D developed by universities), public services or goods innovations (ex: infrastructure), financial support innovations (introducing new programmes such as innovation subsidies), innovations in behavioural incentives provided, systemic innovations and conceptual innovations (adapted from Windrum, 2008).

So far there is a wide literature in economics analyzing the impact of procurement, regulations, knowledge spillovers from universities, R&D subsidies and tax credits on business innovation, employment, sales growth, export, business survival and productivity (Aschhof and Sofka, 2009, Crespi et al., 2011, Paraskevopoulou, 2012, Wren and Storey,

2002). The economic literature is supplemented by political science studies looking at the impact of ICT or e-government on societal outcomes (Andersen et al., 2010). The economic studies look in general at a particular policy, programme or regulation in a particular country and use treatment evaluation methods to assess its impact on businesses. The key research question in studies such as these is: what would the performance of firms which participated in the programme have been, if they had not participated (counterfactual). Actual implementation of public policy and public programmes could easily have unintended consequences, e.g., **public support could lead to either crowding in or crowding out of private funding**. Mistakes in targeting the programme could lead to displacement or substitution effects. Substitution effects happen when the types of projects funded by innovation agencies are very similar to the types of projects funded by firms (Crespi et al., 2011). This induces perverse effects on companies to substitute between projects and carry them on with public funding. Displacement effects happen when firms which do not participate in public programmes do not survive on the market or are worse off due to the public programme. Moreover the programme can have a deadweight effect if the change observed among direct beneficiaries would have occurred even in the absence of the programme, therefore public spending did not create any value added.

Regulations are demand side instruments whose primary goal is to change private actors' behaviour (Aschhof and Sofka, 2009). Paraskevopoulou (2012) distinguishes between regulatory policies that explicitly include the innovation process in their objectives such as IPR regulations, competition regulations and industry-university links and others whose primary aim does not refer to innovation but nevertheless carry significant repercussions for it such as regulations concerning environment, health and safety, employment conditions etc. Aschhof and Sofka (2009) following the OECD (1997) classify regulations as: economic (e.g. anti-trust policy, price control), social (e.g. environmental or safety regulations) or administrative (e.g. product liability).

Regulations can have both a direct and an indirect effect on innovation. **By establishing new regulations the government modifies the framework conditions**

in which firms operate and innovate while at the same time new regulations can force firms to adopt new standards for their products and processes (Aschhof and Sofka, 2009). Regulations can have consequences for both technological innovations, by modifying for example environmental and human safety regulations and for non-technological innovations, through the management of innovation within and across organizations, regulations can influence the structure of industries, the demand patterns and the institutional context in which firms operate (Paraskevopoulou, 2012). Therefore regulations can be seen as an inducement mechanism for technical change influencing the direction of technological innovation (Paraskevopoulou, 2012). The relationship between regulation and innovation is dynamic in the sense that regulations influence innovations which create new conditions to be regulated (Paraskevopoulou, 2012).

The Fraunhofer Institute for Systems and Innovation Research (2004) analyzed the effect of regulation on innovation using a survey applied to 250 European companies. Their findings suggest that **the most important regulations for product and services innovations were related to health and safety aspects, the quality of products and services and the question of liability**. Moreover their findings emphasized that regulations had both positive effects on liability claims or increased acceptance of new products by consumers and users and negative effects such as increasing labour and development costs.

The government is both a major producer of public services and a consumer in certain industries such as defence, education or health care services. **As a consumer governments can act as an early-state or lead user of innovations** enabling companies to learn and refine their products and experience cost reductions quickly (Aschhof and Sofka, 2009). Wide dissemination can lead to reduced prices and newly created or extended markets for private demand. Therefore public demand can drive private demand.

Governments foster innovation in the scientific and technological infrastructure by direct support for basic research and applied research within Universities. Fundamental research expands the capability of the economy to generate new inventions and innovations

(Aschhof and Sofka, 2009). Public knowledge creation can be used by firms to complement internal R&D or awareness of emerging technologies however there is also the risk of creation of new knowledge that cannot be explored yet on the market (Aschhof and Sofka, 2009). Therefore the European Commission developed collaborative programmes attempting to link businesses with universities.

University-industry interactions take several forms such as joint research, contract research, personnel mobility and training. Most studies show that firms profit from this type of collaboration such as: R&D collaboration with universities and research institutions increases a firms 'sale attributable to market novelties, collaboration with universities has a positive impact on a manufacturing firm's probability of applying for a patent and it has a positive impact on increasing the firm's innovative sales (Aschhof and Sofka, 2009). However several authors warn that these positive effects are primarily limited to certain high technology industries and large firms with high R&D intensities and related absorptive capacities (Aschhof and Sofka, 2009).

At an aggregate level, **the relationship between public sector innovation and private sector innovation is bidirectional**. Innovations in the private system can affect and influence public sector innovations in a positive or a negative way. The example of the recent financial innovations that brought a global financial crisis had a negative impact on public sector finances resulting in budget cuts and slowing growth in public sector employment. An example of a positive impact is the adoption of improved information and communication technologies resulting in the introduction and improvement of e-government services. Innovations in the public sector can also influence innovation in the private sector in a positive or negative way. A positive example is the introduction of simplified procedures to apply for permits, or the recent adoption of the common European patent which will significantly reduce the costs of applying for a patent. A negative example is fostering corruption and informal payments to bypass failures in regulations or administration.

6.2. Results from the Innobarometer 2011 report

The Innobarometer 2011 survey on the “Impact and perception of public sector innovation among companies” was carried out by TNS opinion between 16 February and 7 March 2012 and collected responses from 10,112 companies of which 8,699 in EU27 Member States. The main objective of the Innobarometer 2011 survey was to identify the introduction of improved public services for businesses, their impact on business performance, if these improvements were due to public sector innovation and the importance of innovation versus low cost in winning public tenders. Aggregate results at the country level have been reported in the Innobarometer 2011 report (European Commission, 2012).

From a business perspective, there are considerable potential benefits to be gained from public sector innovation. For example, reducing the time needed for administrative procedures can save businesses valuable time that they can spend on their core business activities. According to the survey, a majority of respondents who observed the introduction of measures to improve public services say that their experience of using those services has improved as a result. Likewise nearly two-thirds (63%) of respondents who observed a significant improvement in public services for business attribute that improvement to innovation. The survey results show that there is a high demand for public sector innovation among businesses. A large majority of respondents (87%) agree – most of them strongly – that public services need to upscale their efforts to become more innovative in order to better match businesses’ needs.³⁰ The following are some of the main findings as reported in the Innobarometer 2011 report³¹.

Companies’ use of public services

- Half of all firms (48%) say that the standard of public services for business has stayed the same over the past three years. Less than a fifth (17%) say these services have improved, and just over a fifth (21%) say they have deteriorated.

- Over two-thirds of firms have observed the introduction of measures to enable the completion of government forms online and also the provision of online access to information on government services. But only a minority have observed the introduction of other services.
- A clear majority of firms – between 75% and 64%, depending on the service in question – who observed the introduction of measures to improve public services say that their experience of using them has improved as a result.
- Nearly two-thirds (63%) of firms who observed a significant improvement in public services for business attribute that improvement to innovation.
- Innovation is judged to have had a much more positive impact on some public service functions than on others: while 82% of firms say that innovation has had a positive impact on the time their company has to spend using public services, only 38% say innovation has benefitted personnel skill levels.

Views on innovation in public services

- A majority of firms say that the public sector is not helping their company to innovate, for example in terms of creating the right conditions for innovation and of delivering training systems to enable personnel to innovate.
- A large majority (87%) of firms say that public services need to work harder at becoming more innovative.

Public procurement and innovation

- A quarter (24%) of public procurement interactions included the possibility of selling an innovation to the government.
- Half of all firms consider price to be more important than innovation in a public tender for both goods and services, twice as many as the number who emphasise innovation over price.

³⁰ This paragraph is a shortened version of the summary provided at http://ec.europa.eu/enterprise/policies/innovation/facts-figures-analysis/innobarometer/index_en.htm

³¹ The main findings reported here are copied from the Innobarometer 2011 report (European Commission, 2012) and have been slightly revised.

6.3. The impact of public sector innovation on firm performance: Results from an econometric analysis

Where the Innobarometer 2011 report provided aggregate results at the country level, this section will use the Innobarometer 2011 firm-level data to evaluate the impact of public sector innovation on firm performance. In particular we will be testing the following five hypotheses:

1. Public sector administration innovations are expected to have a positive impact on company innovation and on increasing sales.
2. Public services innovations are expected to have a positive impact on company innovation and on increasing sales.
3. Public services for innovation are expected to have a higher positive impact on company innovation among companies that use services for innovation.
4. Companies that innovate are more likely to experience an increase in sales.
5. Procurement is expected to have a positive impact on increasing sales.

Section 6.3.1 first explains the construction of the variables used in our regressions. Section 6.3.2 presents the econometric results for the impact of public sector innovation on the probability that a firm will innovate, that a firm will use public services for innovation and that a firm will have grown. Section 6.3.3 summarized the evidence for each of the five hypotheses.

6.3.1. Descriptive results

The Innobarometer 2011 has several questions on improvements in the supply of public services by public administration including options to complete government forms over the internet, reduction in the time and effort needed for companies to complete government forms, access to information on government services over the internet, reduction in the time required for permits or licenses, faster response time for government services and reduction in the financial costs for companies. An index has been constructed to measure how many improved public services have been introduced: **the index of improved public administration procedures** measures the degree of the introduction of new administration for businesses. About 13% of companies have not experienced any introduction of improved public administration procedures and almost 11% of companies have experienced the introduction of all 6 types of improved public administration procedures.

The indicator **the use of public services for innovation** measures if a company has used at least one of the following public services: 'applying for research or innovation subsidies', 'applying for patents or trademarks', 'conformity certifications for new products', 'other (such as starting a business, obtaining legal advice or obtaining subsidies for research or innovation activities). The rationale for grouping different services is that all these services provided by the government aim to increase firm innovation.

Companies that innovate are more likely to use services for innovation compared to companies that do not innovate (Table 1 shows that 50.3% of innovators have used at least one service for innovation as compared to 21.3% of non-innovators). Innovating companies are more likely to observe the introduction of improved services by public administration, in particular for the option to complete government forms over the internet and access to information on government services over the internet. Innovating companies are more likely to observe a general improvement in public services. There is no difference between innovators and non-innovators in their perception that public services must become more innovative to better match business needs. Innovating companies are more likely to experience increasing sales whereas non-innovators are more likely to experience stable or decreasing sales. A higher share of innovators have won at least one public procurement contract.

Companies using services for innovation are more likely to be an innovator. Companies using services for innovation are more likely to have experienced the introduction of improved services by public administration, in particular access to information on government services over the internet and reduction in the time required for permits or licenses. These companies are also more likely to share a more positive perception that public services have improved in general. Companies using services for innovation are more likely to experience an increase in sales and to have won a public procurement contract.

Companies with increasing sales are more likely to be an innovator and use services for innovation (in particular applying for patents or trademarks). Companies with increasing sales are also more likely to have experienced the introduction of improved services by public administration, in particular the option to complete government forms over

the internet and faster response time for other government services.

The descriptive results look at the direct effect between two variables without taking into account the effect of other variables. E.g. larger firms are more likely to innovate and to explain the effect of public sector innovation on the probability that a company will innovate we have to control for differences in firm size. The following section will do this by using different econometric techniques.

6.3.2. Econometric results

The impact of innovations in public administration procedures

The option to complete government forms over the internet, access to government services over the internet and reduction in financial costs to the company are positively associated with the probability that a company will innovate (Table 8). Although the introduction of the option to complete government forms over the internet is positively associated with company innovation, this innovation did not lead to a reduction in time and effort to complete government forms. Overall the time required for obtaining permits and licenses did not reduce. Although the individual impact of each of these measures is estimated to be around 2-3% on company innovation we think that the cumulative effect of introducing more innovations in public administration procedures will be higher. Indeed Model 2 in Table 8 uses the index of improved public administration procedures to test the cumulative impact of six measures and the results show that **companies that perceive a higher improvement of public administration procedures by 1 unit are expected to have a higher probability to innovate by 8.3%**. The six items included in the index for improved public administration procedures are moderately correlated to one another and using the index instead provides better estimation results for company innovation. However on the other hand the aggregation can create artificial effects as for example in the case of increasing sales. None of the innovations in public administration has an impact on increasing sales. Therefore we hypothesize that the effect of innovations in public administration on sales goes indirectly through company innovation.

We further test whether improvements in public administration have an impact on the use of services

Table 8: Descriptive statistics

	Company is an innovator		Company has increasing sales		Company uses services for innovation	
	YES	NO	YES	NO	YES	NO
Company is an innovator	--	--	52.5%	37.7%	64.8%	33.0%
Use of services for innovation	50.3%	21.3%	41.8%	28.6%	--	--
<i>Applying for research or innovation subsidies</i>	23.4%	5.9%	17.5%	10.8%	--	--
<i>Applying for patents or trademarks</i>	20.2%	6.0%	16.5%	9.2%	--	--
<i>Conformity certification for new products</i>	24.0%	8.6%	18.8%	12.9%	--	--
<i>Other (such as starting a new business)</i>	22.3%	9.0%	18.8%	12.0%	--	--
Training programs for employees	42.5%	30.9%	38.1%	34.5%	--	--
Obtaining work permits for foreign workers	14.2%	8.0%	12.6%	9.3%	--	--
Health and safety issues	48.4%	36.8%	43.8%	40.5%	--	--
Environment related permits and obligations	44.9%	27.9%	40.2%	32.0%	--	--
Index of improved public administration procedures	50.6%	45.7%	49.9%	46.4%	52.6%	45.4%
<i>Option to complete government forms over the internet</i>	80.8%	72.9%	79.0%	74.6%	81.1%	73.9%
<i>Reduction in the time and effort for filling forms</i>	48.3%	44.8%	47.5%	45.5%	51.1%	43.8%
<i>Access to information on government services over the internet</i>	78.1%	71.7%	76.5%	73.1%	80.5%	71.4%
<i>Reduction in the time required for permits or licenses</i>	30.5%	27.1%	29.9%	27.6%	34.6%	25.3%
<i>Faster response time for other government services</i>	36.2%	31.8%	36.4%	31.9%	38.5%	31.3%
<i>Reduction in financial costs to your company</i>	22.2%	18.1%	22.0%	18.4%	24.4%	17.6%
General perception public services have improved	31.1%	23.5%	31.5%	23.7%	31.9%	24.1%
Public services must be more innovative to match business needs	92.9%	91.9%	92.6%	92.1%	93.6%	91.7%
Sales of company have increased	49.3%	34.8%	--	--	50.5%	36.3%
Sales of company have decreased	25.9%	35.3%	--	--	25.9%	33.9%
Sales of company have remained the same	24.9%	29.9%	--	--	23.6%	29.8%
Company exports abroad	49.1%	28.6%	46.6%	31.3%	52.8%	29.7%
High share of employees with a university degree	11.4%	8.6%	10.6%	9.3%	10.7%	9.3%
Average share of employees with a university degree	63.7%	47.4%	60.5%	50.3%	68.2%	47.4%
Low share of employees with a university degree	25.0%	44.1%	28.9%	40.5%	21.1%	43.2%
Company has been taken over or merged with another company	13.2%	7.8%	12.1%	8.8%	14.0%	8.1%
Company won at least one procurement contract	28.7%	21.8%	26.4%	23.7%	30.7%	21.8%
Company is less than 6 years old	13.2%	16.7%	17.8%	13.3%	13.5%	16.0%
Very small firm: less than 10 employees	33.3%	52.9%	34.7%	51.0%	27.3%	53.1%
Small firm: between 10 and 50 employees	32.9%	31.9%	34.7%	30.7%	34.6%	31.2%
Medium-sized firm: between 50 and 250 employees	23.8%	12.5%	22.3%	14.0%	25.9%	13.0%
Large firm: more than 250 employees	10.0%	2.8%	8.4%	4.2%	12.2%	2.7%

for innovation and find that the option to complete government forms over the internet, access to information on government services over the internet and a reduction in the time required for permits and licenses have a significant impact on the use of public services

for innovation. Considering the cumulative impact of innovations in public administration, **companies that perceive an increase of 1 unit in the index of public administration are 13.4% more likely to use services for innovation (Table 9).**

Table 9: The impact of innovations in public administration procedures

	Company is an innovator		Company has increasing sales		Company uses services for innovation	
	MODEL 1	MODEL 2	MODEL 1	MODEL 2	MODEL 1	MODEL 2
Index of improved public administration procedures		0.083		0.049		0.134
Option to complete government forms over the internet	0.039		0.026		0.050	
Reduction in the time and effort for filling forms	-0.009		-0.008		0.000	
Access to information on government services over the internet	0.030		0.011		0.046	
Reduction in the time required for permits or licenses	0.008		-0.006		0.054	
Faster response time for other government services	0.027		0.015		0.017	
Reduction in financial costs to your company	0.027		0.025		0.031	

Notes: The table provides estimates from a linear probability model also known as linear regression. Significant results highlighted in bold, significance at 95% confidence interval. Control variables include: export, merger, human capital skills, firm size, sectors and country dummies. Using a multinomial logit with three outcomes instead of linear regression for sales does not modify the results.

The impact of innovations in public services

We further test the impact of innovations in public services on company innovation, increasing sales and the use of services for innovation. We find that **companies that perceive in general that public services have improved are expected to be 8% more likely to innovate**. Companies that perceive public services have deteriorated are 3%

more likely to innovate compared to companies that perceive the status quo was maintained, however in this case the probability value is very close to the 0.05 threshold suggesting that results could change if we would control for more variables. **Companies that perceive public services have improved in general are 4% more likely to experience an increase their sales and 6% more likely to use services for innovation (Table 10).**

Table 10: The impact of innovations in public services

	Company innovation	Increasing sales	Use of services for innovation
Public services have improved (ref: Public services remained the same)	0.087	0.044	0.063
Public services have deteriorated (ref: Public services remained the same)	0.029	-0.052	0.012

Notes: The table provides estimates from a linear probability model also known as linear regression. Significant results highlighted in bold, significance at 95% confidence interval. Control variables include: export, merger, human capital skills, firm size, sectors and country dummies.

The impact of using public services for innovation on company innovation

We further test the hypothesis that companies that use public services for innovation are more likely to innovate. **We find that companies that use services for innovation are 27% more likely to innovate** (Table 11, column 4). If endogeneity

would not be taken into account the effect of public services for innovation would be underestimated by 7% as seen in column 1 where we estimate a linear regression and find an effect of 21%. When we control for endogeneity we exclude the possibility that more innovative companies could be applying and using more services for innovation therefore the effect can be interpreted as a causal effect.

Table 11: The impact of using public services for innovation on company innovation

	Not controlling for endogeneity		Controlling for endogeneity		
	LPM OLS	Probit MLE	LPM 2SLS	Bivariate probit MLE IV	Bivariate probit MLE: no IV
Coefficient	0.21	0.58	0.66	0.76	-0.10
Marginal effect of the use of services for innovation	0.21	0.19	0.66	0.27	-0.03
Rho				-0.10	0.40
Number of observations	8276	8276	8276	8276	8276

Notes: Significant results highlighted in bold. 2SLS is estimated using ivreg2. Average marginal effects are calculated using the margins option in Stata. We use the index of improved public administration procedures as an instrument. Control variables include: export, merger, human capital skills, firm size, sectors and country dummies.

Differences in the perception of the impact and functioning of public services for innovation on company innovation

We further hypothesized that public services for innovation are expected to have a higher positive impact on company innovation among companies that use services for innovation. In Table 11 we find that there is no difference in the overall perception of innovations in public services on company innovation between companies that use services for innovation and

companies and companies that do not. We test the impact and functioning of different public services for innovation. We find that among non users of services for innovation, the perception that the information and advice is not easily available has a negative significant impact on the probability that a company innovates.

Among users of public services for innovation, working with public research organizations on innovation projects has a significant positive impact on the probability that a company innovates (Table 12).

Table 12: Testing for differences in the perception of the impact and functioning of public services for innovation on company innovation between companies that do and do not use services for innovation

Probability that a company will innovate	No use of services for innovation	Use of services for innovation
Public services have improved (ref: Public services remained the same)	0.098	0.087
Public services have deteriorated (ref: Public services remained the same)	0.005	0.032
Public services providers are doing a good job in creating the right conditions for companies to innovate	0.019	-0.012
The regulatory and fiscal system promotes the ability for companies to innovate	0.016	0.016
Companies can work closely with public research organisations on innovation projects	0.012	0.061
The public education and training system has equipped companies' staff with the knowledge and skills needed to innovate	-0.012	-0.036
The provision of information and advice helping companies to innovate is of a high quality	-0.016	-0.011
The information and advice available to companies is easily available	-0.076	-0.051
The procedures to obtain financial support for companies to innovate (e.g. grants, tax reliefs) are simple-to-use	-0.044	-0.008
Government's programmes are well targeted to support innovation in companies	0.023	0.043

Notes: The table provides estimates from a linear probability model also known as linear regression. Significant results highlighted in bold, significance at 95% confidence interval. Control variables include: export, merger, human capital skills, firm size, sectors and country dummies.

The impact of company innovation and procurement on increasing sales

Ideally one would like to ask whether company innovation has a positive impact on increasing sales or whether firms that grow faster are more likely to innovate. Results in the literature are not clear cut concerning this question. **Table 13 reveals**

endogeneity between increasing sales and company innovation, we see that if a firm innovates it is 8% more likely to experience positive increasing sales but on the other hand we also see that companies that experience a increasing sales are 7% more likely to innovate. Therefore, we cannot tell the direction of effects. We need an instrumental variable to be able to establish causality.

Table 13: Revealing endogeneity

Probability that a company will innovate	Use of services for innovation	Increasing sales	Company innovation
Use of services for innovation		0.04	0.20
Company is an innovator	0.18	0.08	
Increasing sales			0.07
Index of improved public administration procedures	0.10	0.04	0.05
Environment related permits and obligations	0.15	0.00	0.07
Won a procurement contract	0.04	0.00	0.05

Notes: The table provides average marginal effects estimates from a probit model. Significant results highlighted in bold, significance at 95% confidence interval. Control variables include: export, merger, human capital skills, firm size, sectors and country dummies.

Before presenting causal results we notice that contrary to our expectations we do not find a significant impact of procurement on increasing sales. This result tells us that **firm that have won a procurement contract do not grow faster than firms that did not. Procurement has a positive impact on company innovation and on the use of services for innovation (Table 14).**

We further use the index of improved public administration procedures as an instrument to establish a causal impact of innovation on increasing sales. We find that company innovation does not have a significant impact on increasing sales.

Table 14: The causal effect of company innovation on the probability of increasing sales

Probability for a company to have increasing sales	Not controlling for endogeneity	Controlling for endogeneity
	LPM OLS	Bivariate Probit MLE IV
Company is an innovator	0.085	0.012
Public services have improved	0.035	0.057
Public services have deteriorated	-0.055	-0.013
Index of improved public administration procedures	0.010	
Rho		0.10
N sample	7285	7285

Notes: Significant results highlighted in bold, significant at 95% confidence interval. Average marginal effects are calculated using the margins option in Stata. We use the index of improved public administration procedures as an instrument. Control variables include: export, merger, human capital skills, firm size, sectors and country dummies. Reference category is public services remained the same.

6.3.3. Conclusions

We formulated 5 hypotheses on the impact on public sector innovations on company performance and our analysis found the following results:

Hypothesis 1. Public sector administration innovations have a positive impact on company innovation but its impact is non significant on increasing sales. Companies that perceive a higher improvement of public administration procedures by 1 unit are expected to have a higher probability to innovate by 8.3%. We also find that companies that perceive an increase of 1 unit in the index of public administration procedures are 13% more likely to use services for innovation.

Hypothesis 2. Companies that perceive in general that public services have improved are expected to be 8% more likely to innovate, 4% more likely to experience an increase in their sales and 6% more likely to use services for innovation. We also find that companies that use services for innovation are 27% more likely to innovate.

Hypothesis 3. We also test the impact and functioning of different public services for innovation. We find that among non users of services for innovation, the perception that the information and advice is not easily available has a negative significant impact on the probability that a company innovates. Among users of public services for innovation, working with public research organizations on innovation projects has a significant positive impact on the probability that a company innovates.

Hypothesis 4. We find that if a firm innovates it is 8% more likely to experience increasing sales but we also see that companies that experience increasing sales are 7% more likely to innovate. Therefore, we cannot tell the direction of effects without using an instrument. Using an instrument we show that company innovation does not have a significant impact increasing sales.

Hypothesis 5. We find that firms that won a procurement contract are not more likely to have increasing sales compared to firms that did not win a procurement contract. We also find that procurement has a positive impact on the probability that a company will innovation and on the use of services for innovation.

7. Conclusions and recommendations

Public sector innovation will help to meet societal challenges ...

The public sector plays a key economic role as regulator, service provider and employer and accounts for a significant share of economic activity in European and other developed countries. In the majority of EU member states, the public sector e.g. accounts for more than 25% of total employment. The public sector has developed markedly different from the private sector, where efficiency and innovation are key for economic success. For decades, the public sector – in particular public administration – has enjoyed a rather inconspicuous existence. Current budgetary constraints and societal pressures however are drivers of the plea for efficiency gains, better governance and more user involvement. In this respect, the public sector and innovation are of key concern and interest. The majority of European governments acknowledge the importance of public sector innovation as a means by which to help cope with current austerity measures on the one hand and, for the longer term, to better address globalisation and grand societal challenges on the other.

... but has not been studied in as much detail as private sector innovation ...

However, public sector innovation is a phenomenon that is somewhat under-researched and perhaps even more critically poorly documented. Whereas there is a long tradition of about 20 years measuring innovation using innovation surveys in private business only recently the first surveys have been carried out to measure innovation in the public sector. The first EU wide survey was the Innobarometer 2010 which surveyed more than 4,000 public administration organisations showing that more than 90% of such organisations had introduced at least one innovation over a three-year period.

... encouraging the European Commission to launch a new monitoring tool ...

Following the Europe 2020 Innovation Union flagship initiative (commitment 27) the European Commission has been piloting the European Public Sector Innovation Scoreboard (EPSIS) as a basis for further

work to benchmark public sector innovation. The pilot European Public Sector Innovation Scoreboard is the first EU wide attempt to better understand and analyse innovation in the public sector. Where the Innovation Union Scoreboard (IUS) provides a benchmark for business innovation at the country level using hard and softer data from various sources including Eurostat, the European Public Sector Innovation Scoreboard (EPSIS) monitors innovation performance of the public sector.

... for which two special surveys have collected data on public sector innovation.

Due to limited data availability for the public sector at large, two special Innobarometer survey have been launched to obtain more information. The Innobarometer 2010 provides results of a survey among 4,000 organisations active in public administration. The Innobarometer 2011 provides results of an opinion-survey among more than 10,000 European firms on the perceived impact of improved public services and public sector innovation on business performance. Despite the usefulness of the information obtained, these surveys provide a snapshot view only and they are not replicated on a regular basis. In order to obtain more insights and to monitor the innovation performance of the public sector, it is necessary to agree on a limited number of key indicators and start collecting them in the EU Member States.

Innovative public services act as a driver of business performance

A detailed analysis of the Innobarometer 2011 firm-level data shows the importance of public sector innovation for business performance:

- **Public sector administration innovations have a positive impact on the probability that a company will innovate** but its impact is non significant on increasing sales. Companies that perceive a higher improvement of public administration procedures by 1 unit are expected to have a higher probability to innovate by 8.3%. We also find that companies that perceive an increase of 1 unit in the index of public administration procedures are 13% more likely to use services for innovation.

- **Public services innovations have a positive impact on the probability that a company will innovate and on increasing sales.** Companies that perceive in general that public services have improved are expected to be 8% more likely to innovate, 4% more likely to experience an increase in their sales and 6% more likely to use services for innovation. We also find that companies that use services for innovation are 27% more likely to innovate.

- **Public services for innovation have a higher positive impact on company innovation among companies that use services for innovation.**

Among non users of services for innovation, the perception that the information and advice is not easily available has a negative significant impact on the probability that a company innovates. Among users of public services for innovation, working with public research organizations on innovation projects has a significant positive impact on the probability that a company innovates.

- **Companies that innovate are not more likely to experience an increase in sales.** We find that if a firm innovates it is 8% more likely to experience increasing sales but we also see that companies that experience increasing sales are 7% more likely to innovate. Our econometric results show that we cannot tell the direction of effects.

- **Government procurement has a positive impact on the probability that a company will innovate.** Our results show that firms that won a procurement contract are not more likely to have increasing sales compared to firms that did not win a procurement contract. We also find that procurement has a positive impact on the probability that a company will innovation and on the use of services for innovation.

The pilot EPSIS uses a similar framework as the Innovation Union Scoreboard ...

The pilot EPSIS uses a measurement framework similar to that used for the Innovation Union Scoreboard (IUS) distinguishing between Enablers, Activities and Outputs. For Enablers 7 indicators

are used for measuring two innovation dimensions: Human resources and Quality of public services. For Activities 7 indicators are used for measuring two innovation dimensions: Capacities and Drivers and barriers. For Outputs 8 indicators are used to measure performance in three innovation dimensions: Innovators, Effects on business performance and Government procurement. The indicators are used to construct the EPSIS scorecard showing relative strengths and weaknesses for each Member State.

... but with overall limited data availability the EPSIS has to be seen as a pilot exercise

Due to the quality of data, with small sample sizes for the Innobarometer 2010 and opinion-based data for the Innobarometer 2011, the pilot EPSIS 2013 is an exploratory analysis, based on limited available information plus the information obtained via the Innobarometer study. The value of the scoreboard to policy makers and other interested stakeholders could certainly be improved if data was to be collected on a regular basis. Copying an instrument such as the Community Innovation Survey, which provides us with ample insights on the innovation behaviour in the private sector and as a survey is adopted around the world, may be one example of how to obtain important insights on public sector innovation.

More data are needed to benchmark public sector innovation

More robust data are needed to compile an EPSIS of comparable quality as the IUS and it will require increased efforts at the EC and Member State level to collect data to further improve the measurement framework and to extend the current EPSIS focusing on public administration to include other public sectors.

Public services are offered by more public sector organisations than public administration, but innovation data for these sectors have not yet been collected and more surveys are needed to fully capture innovation in the public sector. For the design of these surveys some valuable lessons can be drawn from the Innobarometer 2010 and 2011 surveys. First, sample sizes need to be sufficiently

large to be able to calculate representative results at the country level. Second, the questionnaires should be focused on measuring the most relevant aspects of public sector innovation. The Innobarometer 2011 included questions on improvements in only a few public services and can therefore not provide a full picture of the importance of public services in general, the questionnaire tried to cover many different aspects as given constraints in the number of questions to be included the level of detail for several of these questions was insufficient to derive robust econometric results on their importance for the probability that a company will innovate or will experience increasing sales. A possible solution could be to refrain from telephone surveys and instead use written or on-line surveys which could include more questions but could also be use to reach a larger sample.

... and the European Commission should take leadership

The feedback from officials consulted as part of the "Trends and Challenges in Public Sector Innovation in Europe" study (Rivera Leon et al, December 2012) confirms that further efforts to develop the measurement and benchmarking of public sector innovation would be of interest to most if not all Member States and that this is an area where the Commission should continue to show leadership.

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Annex 1: EPSIS indicator data

	1.1.1	1.1.2	1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	2.1.1	2.1.2	2.2.1	2.2.2	2.2.3	2.2.4	2.2.5	3.1.1	3.1.2	3.1.3	3.2.1	3.2.2	3.3.1	3.3.2	3.3.3
BE	29.8	16.8	1.59	1.30	4.4	78.8	0.77	76.0	74.0	57.0	57.95	68.46	53.06	21.4	91.0	29.1	26.5	32.5	15.7	19.0	4.1	14.8
BG	30.0	57.7	0.01	0.61	3.8	70.0	0.61	59.6	70.2	49.2	37.50	52.30	41.77	25.1	88.5	30.3	--	33.2	14.0	10.9	3.5	23.7
CZ	18.2	16.1	1.01	1.24	4.0	73.8	0.65	53.3	61.9	19.6	26.06	26.42	19.39	15.7	88.6	26.0	25.0	18.3	10.3	21.3	3.5	9.6
DK	26.0	29.8	2.17	1.90	5.3	94.7	0.89	66.0	100.0	33.2	31.46	54.67	23.55	26.2	100.0	48.5	33.4	31.1	8.7	47.8	4.3	21.4
DE	25.3	8.6	1.55	1.58	4.6	94.7	0.81	47.8	65.8	16.7	14.79	24.93	22.14	16.5	84.0	21.2	21.9	23.3	8.2	24.7	4.2	8.6
EE	35.4	64.6	1.22	1.45	5.6	93.8	0.80	55.8	71.2	29.9	37.62	39.46	24.35	28.8	92.3	15.2	24.5	36.8	8.5	27.3	4.2	12.2
GR	16.3	23.2	0.52	0.65	4.7	100.0	0.71	60.0	68.0	41.1	26.94	30.07	25.37	15.4	93.0	16.1	23.0	19.7	20.7	25.2	3.4	28.2
ES	20.4	45.0	0.98	1.19	3.8	47.5	0.69	88.8	91.5	31.0	27.08	52.92	32.78	26.5	97.3	35.7	22.4	22.5	19.0	31.5	3.0	13.6
FR	15.7	13.6	1.44	1.34	4.4	95.0	0.78	43.4	48.4	19.6	27.31	31.08	24.46	15.6	72.8	12.2	27.7	30.9	27.2	22.9	3.4	10.1
IE	19.7	32.1	1.31	1.65	5.1	85.0	0.86	80.0	90.0	31.0	36.84	68.24	28.72	34.1	98.0	39.0	21.9	21.8	11.3	24.4	4.0	10.0
IT	14.2	9.7	0.52	0.85	3.9	100.0	0.72	70.5	80.3	34.2	25.26	30.84	13.28	13.5	89.8	30.4	22.3	13.7	15.2	35.7	3.0	21.4
CY	11.8	49.4	1.50	1.37	4.5	55.0	0.65	60.0	80.0	36.0	40.00	39.29	31.48	22.0	90.0	57.1	--	30.6	18.0	44.9	4.1	14.3
LV	48.3	55.5	0.70	0.98	3.8	93.3	0.66	60.4	84.9	39.8	37.00	47.10	36.36	19.1	100.0	26.2	--	36.0	21.0	13.9	3.4	12.5
LT	48.5	45.9	0.72	0.97	4.8	71.7	0.73	42.0	58.0	43.6	41.76	34.15	35.19	28.7	76.0	12.5	--	39.2	10.0	17.6	3.3	17.9
LU	26.3	36.2	1.71	1.69	5.1	72.4	0.80	60.0	80.0	8.2	10.00	44.44	31.48	29.0	90.0	33.3	18.4	36.4	17.8	20.0	4.7	50.0
HU	21.2	15.8	0.69	1.05	4.0	65.8	0.72	23.0	41.0	17.9	9.84	56.52	24.60	6.8	68.0	6.3	25.3	27.6	12.7	5.8	3.4	1.7
MT	13.5	39.4	1.16	1.42	5.6	100.0	0.71	90.0	90.0	8.3	5.56	64.29	34.88	25.0	100.0	11.1	--	53.2	27.0	40.0	4.3	12.5
NL	39.1	16.3	1.73	1.79	5.0	94.7	0.91	83.0	95.0	17.9	22.51	42.12	26.00	25.7	99.0	27.0	32.1	24.4	8.4	29.1	4.3	16.9
AT	14.8	6.0	1.89	1.52	5.5	100.0	0.78	50.0	63.0	21.9	14.84	29.32	27.54	19.2	85.0	28.6	21.6	18.9	14.0	31.3	4.2	16.2
PL	31.8	56.2	0.71	0.97	3.5	78.8	0.64	66.0	83.4	49.9	57.52	29.25	26.04	19.9	93.6	12.3	19.8	20.5	16.8	17.4	3.3	5.3
PT	14.8	29.5	1.04	0.82	5.5	100.0	0.72	78.2	77.2	28.7	25.79	43.91	32.00	30.5	86.1	37.8	23.9	46.6	35.3	29.0	4.2	24.1
RO	26.3	51.2	-0.14	0.66	3.3	60.0	0.61	58.8	81.4	41.1	22.40	43.55	28.62	29.4	94.1	15.4	--	33.9	12.2	11.1	3.1	11.6
SI	42.8	37.9	1.03	0.75	4.3	95.0	0.75	70.0	86.0	36.2	30.93	38.89	25.55	27.9	94.0	31.6	23.0	18.5	12.5	16.7	3.4	16.7
SK	18.2	32.6	0.85	1.05	3.6	62.5	0.63	66.7	76.5	23.7	20.22	31.23	31.05	24.8	93.1	40.3	21.2	16.0	9.3	15.9	2.8	10.2
FI	37.3	25.8	2.24	1.84	5.2	95.0	0.85	56.4	80.2	20.9	26.40	38.81	15.71	27.4	93.1	26.2	31.0	17.4	12.7	22.9	4.7	6.3
SE	39.3	56.0	2.02	1.72	5.9	100.0	0.86	58.4	79.2	13.5	9.09	60.69	26.00	52.1	95.0	30.6	30.7	31.3	8.0	36.0	4.5	8.8
UK	25.4	35.9	1.56	1.75	4.9	98.3	0.90	74.8	88.5	27.9	33.81	58.77	28.70	34.9	93.0	28.2	26.4	19.1	11.0	27.0	3.9	4.3
HR	24.1	--	0.62	0.56	3.5	65.0	0.73	--	--	--	--	--	--	--	--	--	--	28.3	23.8	11.3	2.9	--
TR	28.3	--	0.35	0.38	4.8	88.8	0.53	--	--	--	--	--	--	--	--	--	--	17.9	57.4	47.8	30.7	3.8
IS	47.1	--	1.58	0.91	5.3	57.5	--	--	--	--	--	--	--	--	--	--	--	29.6	10.7	6.0	25.5	4.4
NO	45.5	55.5	1.79	1.48	5.2	90.0	0.86	46.0	80.0	19.8	20.83	53.19	12.83	29.9	92.0	19.2	25.1	25.4	22.5	20.2	4.0	9.1
CH	32.3	9.6	1.91	1.65	5.3	70.0	0.81	74.0	88.0	16.6	20.22	45.52	23.51	21.1	96.0	24.3	14.8	25.3	19.0	39.8	4.5	8.1
RS	--	--	-0.11	-0.02	3.5	--	0.63	--	--	--	--	--	--	--	--	--	--	--	--	--	3.4	--
MK	--	--	-0.18	0.28	4.1	--	--	--	--	--	--	--	--	--	--	--	--	39.7	--	24.6	3.1	--
EU27	23.1	29.6	1.18	1.26	4.6	84.3	0.75	63.5	75.5	30.2	29.60	40.85	26.52	22.9	89.2	26.1	24.9	20.1	15.0	23.7	3.8	11.9

Annex 2: Correlation table EPSIS indicators

	1.1.1	1.1.2	1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	2.1.1	2.1.2	2.2.1	2.2.2	2.2.3	2.2.4	2.2.5	3.1.1	3.1.2	3.1.3	3.2.1	3.2.2	3.3.1	3.3.2	3.3.3
1.1.1	1	.436*	.121	.085	.084	.103	.103	.270	-.159	.166	.159	.226	.116	-.001	.361	-.228	-.036	.062	-.297	-.319	.120	-.115
1.1.2		1	.018	.532	.662	.594	.594	.156	-.409	.388	.410	.238	.550	.994	.374	.234	.854	.750	.118	.092	.534	.553
1.2.1			1	-.282	-.208	-.077	-.213	-.254	.045	.268	.308	.288	.259	.213	.536**	.313	.018	-.425*	.371*	-.005	-.161	-.116
1.2.2				1	.904**	.723**	.342	.799**	.068	.159	.104	.130	.175	.267	.003	.099	.325	.556**	.048	.979	.403	.549
1.2.3					1	.000	.069	.000	.724	.197	.004	.296	.352	.211	.114	.389	.111	.002	-.086	-.096	.552**	.792**
1.2.4						1	.651**	.240	.809**	.084	-.206	-.240	.277	-.237	.325	.229	.225	.461*	-.058	-.271	.513**	.759**
1.2.5							1	.000	.210	.001	.001	.210	.146	.216	.085	.231	.240	.012	.763	.154	.004	.000
2.1.1								1	.558**	.724**	.005	.388	.080	.145	.477	.010	.473**	.308	.319	.089	.567**	.833**
2.1.2									1	.002	.000	.002	.000	.000	.001	.001	.002	.092	.645	.001	.000	.492
2.1.3										1	.537**	.003	.003	.003	.003	.003	.003	.025	.119	.247	.377*	.030
2.1.4											1	.431*	.313	-.321	.391*	.143	.076	.640**	-.896	.539	.196	.044
2.1.5												1	.020	.036	.459	.695	.000	.550	.226	.046	.000	.806
2.2.1													1	.855**	.754**	.403*	.003	.078	.198	.438*	.112	.146
2.2.2														1	.000	.030	.988	.689	.303	.018	.562	.450
2.2.3																.006	.948	.975	.886	.010	.187	.564
2.2.4																.049	.141	-.006	.042	-.284	-.470*	.033
2.2.5																.049	.139	-.006	.042	-.284	-.470*	.033
3.1.1																.020	.285	.078	.222	.170	.197	.367
3.1.2																.035	.919	.834	.689	.037	.269	.698
3.1.3																1	.081	-.152	-.089	.469*	.185	.281
3.2.1																	.674	.431	.648	.010	.338	.140
3.2.2																	1	-.475**	-.204	.150	.253	-.111
3.3.1																		.009	.289	.436	.186	.566
3.3.2																		1	.453*	.088	.289	.260
3.3.3																			.013	.651	.129	.174
																			1	.106	.015	.210
																				.583	.939	.275
																				1	.471**	.078
																					.010	.686
																					1	.157
																						.415
																						1

Pearson correlations. Standard errors in italics. ** : Correlation is significant at the 0.01 level (2-tailed). * : Correlation is significant at the 0.05 level (2-tailed).
See Annex 4 for corresponding indicator names.

Annex 3: Correlation table EPSIS indicators and IUS dimensions

	SII 2011	Human Resources	Research Systems	Finance Support	Firm Investments	Linkages Entrepreneurship	Intellectual Assets	Innovators	Economic Effects
1.1.1	.023	.383*	.067	.401*	.089	.062	.032	-.240	-.315
	.907	.040	.728	.031	.644	.749	.868	.209	.096
1.1.2	-.431*	-.095	-.387*	-.135	-.130	-.234	-.491**	-.434*	-.556**
	.020	.624	.038	.486	.503	.222	.007	.019	.002
1.2.1	.807**	.531**	.775**	.751**	.424*	.792**	.762**	.561**	.423*
	.000	.003	.000	.000	.022	.000	.000	.002	.022
1.2.2	.713**	.423*	.673**	.681**	.378*	.676**	.684**	.433*	.456*
	.000	.022	.000	.000	.043	.000	.000	.019	.013
1.2.3	.650**	.328	.646**	.674**	.424*	.613**	.647**	.451*	.308
	.000	.082	.000	.000	.022	.000	.000	.014	.104
1.2.4	.379*	.085	.380*	.534**	.264	.328	.522**	.068	.151
	.043	.662	.042	.003	.166	.082	.004	.726	.435
1.2.5	.761**	.528**	.833**	.885**	.311	.750**	.712**	.363	.377*
	.000	.003	.000	.000	.101	.000	.000	.053	.044
2.1.1	.120	-.098	.181	.004	-.028	.151	.114	.208	.083
	.536	.612	.346	.983	.886	.436	.556	.278	.670
2.1.2	.253	.112	.291	.215	.116	.300	.247	.144	.096
	.186	.562	.125	.262	.550	.114	.197	.455	.621
2.2.1	-.372*	-.042	-.315	-.254	-.136	-.186	-.407*	-.315	-.508**
	.047	.827	.096	.183	.482	.333	.028	.096	.005
2.2.2	-.210	.100	-.158	-.024	-.063	-.005	-.285	-.190	-.473**
	.274	.607	.413	.902	.746	.978	.135	.322	.009
2.2.3	.118	-.035	.261	.162	-.055	.206	.055	-.094	.080
	.542	.859	.171	.400	.777	.284	.775	.629	.680
2.2.4	-.285	-.204	-.232	-.308	-.217	-.202	-.258	-.155	-.263
	.133	.289	.225	.104	.258	.294	.176	.422	.168
2.2.5	.246	.367	.293	.521**	.153	.345	.119	.053	-.098
	.198	.050	.123	.004	.429	.067	.539	.785	.614
3.1.1	.219	.123	.210	.140	.232	.240	.214	.099	.115
	.254	.524	.274	.469	.226	.209	.265	.608	.554
3.1.2	.288	.219	.250	.120	.075	.436*	.204	.396*	.029
	.130	.254	.190	.535	.697	.018	.288	.034	.881
3.1.3	.584**	.470*	.605**	.665**	.193	.626**	.462*	.334	.323
	.001	.010	.001	.000	.315	.000	.012	.077	.087
3.2.1	-.256	-.472**	-.214	-.158	-.129	-.244	-.152	-.100	-.206
	.180	.010	.265	.413	.504	.202	.433	.607	.283
3.2.2	-.235	-.421*	-.062	-.316	-.335	-.271	-.179	.031	-.156
	.220	.023	.749	.095	.075	.156	.352	.875	.419
3.3.1	.547**	.079	.488**	.263	.394*	.540**	.580**	.567**	.349
	.002	.684	.007	.168	.035	.003	.001	.001	.063
3.3.2	.739**	.382*	.663**	.661**	.528**	.651**	.736**	.546**	.464*
	.000	.041	.000	.000	.003	.000	.000	.002	.011
3.2.3	.037	-.003	.093	-.065	-.219	.036	.086	.219	-.021
	.850	.988	.631	.739	.253	.855	.656	.254	.915

Pearson correlations. Standard errors in italics.

****. Correlation is significant at the 0.01 level (2-tailed).

***. Correlation is significant at the 0.05 level (2-tailed).

1.1.1 Employment share of 'creative occupations'; 1.1.2 Share of employees in public administration with a university degree; 1.2.1 Government effectiveness; 1.2.2 Regulatory quality; 1.2.3 Increased efficiency of government services due to the use of ICT; 1.2.4 Online availability of public services; 1.2.5 E-government development index (EGDI); 2.1.1 Share of service innovators that innovate in-house; 2.1.2 Share of process innovators that innovate in-house; 2.2.1 Importance of internal barriers to innovation; 2.2.2 Importance of external barriers to innovation; 2.2.3 Active management involvement in innovation; 2.2.4 Importance of external knowledge; 2.2.5 Share of employees involved in groups that meet regularly to develop innovations; 3.1.1 Share of organizations in public administration with services, communication, process or organisational innovations; 3.1.2 Share of 'New' services out of all services innovations; 3.1.3 Public sector productivity; 3.2.1 Public services for business have improved in general; 3.2.2 Introduction of innovative public services for business have had a significant impact on their performance; 3.3.1 Government procurement as a driver of business innovation; 3.3.2 Government procurement of advanced technology products; 3.3.3 Importance of innovation in procurement

European Commission

European Public Sector Innovation Scoreboard 2013 – A pilot exercise

2013 – 74 pp – 210 x 297 mm

ISSN 1977-8252

ISBN 978-92-79-27570-8

doi: 10.2769/72467

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European Public Sector **Innovation** Scoreboard 2013

A pilot exercise

NB-AZ-13-001-EN-C



Publications Office

ISSN 1977-8252
ISBN 978-92-79-27570-8
doi: 10.2769/72467



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