



Supply and Demand Side Innovation Policies

First policy brief



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1. INTRODUCTION AND METHODOLOGY OVERVIEW

1.1. Purpose and content of this report

This **first policy brief** presents an overview of the wide set of demand and supply side innovation policies both within the EU and elsewhere in order to identify, classify and characterize the various measures implemented in different contexts and their combination. It is based on a detailed literature review of demand and supply-side innovation policies and the analysis of 20 international cases of innovation policies, instruments and tools selected as representative of good practices to address demand side and/or to combine or interact with supply side approaches.

The cases studies have been selected to cover a large number of countries (in and outside Europe) and sectors (including Health and Energy) and depending on the availability of information (especially of evaluation reports). A common framework (reproduced below) was used to describe these policies and instruments. Each case has been presented in a short report, based on information available through existing reports (direct or indirect information such as EU documents, OECD reports), evaluation reports, and official websites. Furthermore, when available, people in charge of the policies have been contacted to confirm key aspects of the policies, for example impacts and current status of the policy. The detailed reports are annexed to the present document.

The policy brief is structured as follows:

- **Section 2** summarizes the main lessons coming from the literature review with a focus on the mode of interaction with supply-side policies and the framework conditions for innovation policies. This section highlights those framework conditions conducive to innovation and the relative policy framework.
- **Section 3** consists of the global analysis of the 20 cases studied. It presents a typology of the different situations that have been highlighted with a special focus on the interactions between supply and demand side policies and identifies the main lessons learnt. Finally, a discussion of evaluation approaches is provided.
- **Section 4** presents the rationale for selecting five interesting cases to undertake in depth impact assessment and analyses of the interconnections between supply and demand policies.

1.2. Literature review

The organization of the literature review includes the following elements:

1. Innovation Systems and Innovation Policy
2. Demand side innovation policies: rationale and policies
3. Supply side policies: rationale and policies
4. Framework conditions and innovation policy
5. Innovation Policy Mix
 - a. Interaction between supply and demand: linking demand side policies to supply side for an integrated assessment
 - b. Efficiency and effectiveness of the Innovation Policy Mix
6. Drivers, barriers and challenges
7. Selected Bibliography

The present document presents a summary of the main lessons learnt. The full literature review is presented in an annex.

1.3. Reminder of the framework for the case studies

The selection and description of case studies, validated by European Commission services following the submission of the inception report, are not aimed at providing exhaustive descriptions of the cases but rather to focus on addressing some interesting examples that cover a variety of situations/sectors. The selection of 20 international cases of Demand-Side Innovation Policies has been done with a focus to study how Supply-side approaches are combined into Demand-Side Policies and to ensure a wide thematic, sectoral and geographical coverage.

A common framework for describing each case study was validated during the meeting with EC services on the 11th of April and this has been used for the 20 case studies. It comprises a) general description of the policy: denomination, country, geographical and sectoral level of implementation and other descriptive items such as budget, if available etc; b) particular features such as the policy rationale and how it has been translated into the policy design taking into consideration demand factors, supply – side and framework conditions within which the measure is contextualised; c) success factors and critical aspects linked to replicability of the policy.

The case study structure is presented below:

- **Key characteristics of the policy:**

This part describes an overview of the policy: aims, objectives, costs, age. The rationale for the policy are made explicit, for instance creating incentives for innovation by overcoming system failures; targeting innovation towards social challenges and policy end economic needs or fostering business development in a nation/region by exploiting lead market potential.

- **Side - Type - Interactions**

This part describes the nature of the policy regarding its demand, side or combination approach. It is based on the typology which was established through the literature review (see section 2).

- **Interactions with demand/supply side**

Demand-side interventions seldom, if ever, exist in a vacuum and are typically applied alongside (innovation) supply-side policies. There are a number of dimensions to this:

- Demand-side policies may be explicitly combined with other policies as part of a package designed to accelerate innovation. The Technology Platforms developed by the UK Technology Strategy Board are examples of this, where the interaction between businesses (and others) may address demand side issues (such as standards) and supply side (such as R&D collaboration).
- More common, participants in demand side actions may also draw on separate supply-side support programmes which have been designed and implemented independently of the demand-side interventions.
- Demand-side policies may themselves incorporate supply-side elements. It is, for example, sometimes the case that procurement programmes also provide funding to assist businesses with development costs.

This part makes explicit the link and interaction between demand side and supply side approaches and how the link is formally or indirectly addressed by the policy.

- **Assessment of impacts**

The policy interventions have also been analysed in order to:

- Distinguish the impacts generated by the demand-side intervention from those generated by other policies
- Identify when, and how, demand side interventions are complemented and reinforced by supply side policies
- And to take full account of framework conditions prior to the introduction of the policies.

The level and quality of information in this part is dependant of the existence and quality of pre-existing evaluation reports, which, in practice, is extremely limited.

- **Policy lessons**

This part analyses what could be retained from the policy: evidence that the intervention had been successful at least to some degree, identification of failures and reasons associated, strengths or weaknesses of the policy, success factors and critical aspects linked to replicability.

The 20 cases reports are presented in annex.

2. SUMMARY OF THE LITERATURE REVIEW INNOVATION AND INNOVATION POLICY

In the past years there has been an increasing appreciation of how important innovation is to the economy so *that Europe 2020 strategy* puts forward Innovation at the top of its priorities:

- *Smart growth: developing an economy based on knowledge and innovation.*
- *Sustainable growth: promoting a more resource efficient, greener and more competitive economy.*
- *Inclusive growth: fostering a high-employment economy delivering social and territorial cohesion.*

The innovation process varies from country to country, sector to sector, and firm to firm. Innovation studies posit increasing awareness of the significance of interconnectedness between the actors involved in the process. The importance of interactions between participants of the innovation process also extends to include efforts to grasp the complexity and the iterative nature of these processes (e.g., Kline and Rosenberg, 1986).

Drawing on the premises that innovation is a systemic occurrence, and that policy is intended to provide remedies for 1) market failures, 2) support or avert system failures or 3) fast-forward the operations of an economic system, it is clear that an appropriate innovation policy framework must rest on an accurate understanding of the system it seeks to influence.

Furthermore, because innovation systems are more than invention systems, particular attention has to be paid to the integration of potential users into the innovation process. It is already well established that firms identify their customers and suppliers as key providers of information in relation to innovation, a natural consequence of innovation systems being embedded in the self-organisation of market relationships (von Hippel, 1986, 1988). Public purchasing programmes and the identification of lead users are important ways in which the demand side of innovation systems can be influenced by public policy (Edler and Georghiou, 2007).

A wide range of complementary policies provide the basis for promoting the formation of innovation systems. They include policy instruments to facilitate collaborative research, to incubate ideas coming from university staff, use of public procurement to build networks or to stimulate the formation of clusters but etc. In each case the point is to create connections that will not otherwise arise spontaneously. Their principal purpose is to create opportunities and enhance innovative capabilities by stimulating innovation system formation (Metcalf 1995, 2003; Smits and Kuhlmann, 2004).

The literature on innovation and innovation policy traditionally focuses on 1) the framework conditions for innovation i.e. those systemic aspects of the innovation process that are outside the firm – intended as a main innovation innovator; 2) supply side of the innovation process, i.e.

Framework conditions

Allman et al (2011) identifies six key categories of framework conditions. These are defined as those components of the innovation system that are outside the firms, key innovators in the market place, and are characteristics of the competitive environment within which the innovative firms operate. These six key elements are: 1) the public research base, 2) demand conditions, 3) the degree of competition within the market, 4) human resources, 5) finance and 6) infrastructure and services. Whilst these might pertain to the sphere of either supply or demand for innovation, their role is of a basic systemic nature and are key components of the innovation process either through their role in sustaining the creation of new knowledge and the recombination of existing knowledge, or to providing the necessary incentive to innovate, or even providing key resources to the innovation process.

The supply-side

Supply-side factors for innovation have received much more attention than demand-side factors during the past few decades (OECD, 2011). The supply of innovation focuses on the idea that innovation lies mainly in the research and innovation activities of the firms, whereby inventors create opportunities to satisfy consumers' needs.

There are various reasons for this logic, all linking to the significant assistance in making investment on Research, Development and Innovation. The supply side of the innovation process involves technical knowledge, which may be generally available or may also include new scientific and technological knowledge, the result of original research activity. In this context, the crucial contribution of the entrepreneur is to link the novel ideas with the market (Freeman and Soete, 1997). Needless to say, this is an oversimplification. The search activities aiming to produce new knowledge and transform it into new products - including research, development and innovation - form a complex nexus. A vast literature has dealt with it the past few decades (Freeman and Soete, 1997; Fagerberg et al, 2005; Tassef, 2007; Malerba and Vonortas, 2009).

From this rationale, supply side innovation policies focused on the role of research and technological development, the provision of a workforce trained in subjects such as Science, Technology, Engineering and Mathematics (STEM) and stipulations of opportunities for innovation to thrive. In policy terms these stipulations translated in the measures to facilitate access to financing innovative venture, publicly supported venture capitals and loan guarantees. Entrepreneurship policies, support measures for exploiting intellectual property and technical services have been added to the toolbox of the innovation policy maker in order to foster efficiency and effectiveness of RTDI investments and translate scientific and technical knowledge into business propositions (Edler et al 2013).

The demand side of innovation

Demand as a stimulus for growth and as a driver to innovation has been historically an important aspect of economic theory. Demand constitutes an important selection mechanism according to which the market provides feedback for the improvement of the innovation process; it stimulates the creation of new innovations and provides the basis for its diffusion; it is also the playground whereby the innovative suppliers find their innovation partners in the users and customers.

Miles and Rigby (Miles and Rigby 2013) investigated various modes and rationales of demand influence on innovation, and NESTA (NESTA 2010) has investigated how customer demand shapes innovation processes in organizations in selected sectors. The government and the public sector generally play an important role in the economy as regulators but may have also an important role to play in the innovation process as customers. Important work on the link between demand and innovation and policy includes that by the OECD (OECD 2011) which focuses on discussing the impacts of societal demand upon eco-innovation and introduces a way of designing demand-side policy mixes¹. Edler and Georghiou (2007) have defined demand side innovation policy as *'...all public measures to induce innovations and/or speed up diffusion of innovations through increasing the demand for innovations, defining new functional requirements for products and services or better articulating demand'*.

The demand side innovation policy-toolbox includes:

1. Measures to stimulate private demand for innovation;
2. Public procurement policies;
3. Pre-commercial procurement;
4. Innovation inducement prizes;
5. Standardisation and standards and
6. Regulation.

This toolbox includes policy measures that have a direct effect on demand for innovation both from the private end of the market with 'measures to stimulate private demand' such as subsidies for the purchase of technological advanced goods and services, and measures that address the public side of

1. Specific country and area reviews of policy include Buchinger, who introduces Austrian experience regarding public procurement as part of the demand side innovation policy mix. Roolahit importantly has discussed smaller EU countries as the context for demand-side innovation policies and what pre-conditions in terms of institutional requirements are required for the implementation of demand side instruments.

demands consisting in innovation procurement policies including also pre-commercial procurement. Moreover, the toolbox includes other measures that might have an indirect effect on demand for innovation. These are innovation prizes which constitute an incentive to innovate and market new goods and services and measures involving standardisation and regulation aimed at create markets and processes within certain legal frameworks. These measures also contribute to other objectives such as health and safety and internationalisation (i.e. opening new market through standardisation).

The rationale for demand side policies is straightforward: policy makers seek to drive those technologies, products and services in order to promote economic growth and welfare, contribute to societal challenges and to make public services more effective. This is done through demand side measures. Demand-side innovation policies can be subject to various typologies (conceptual classifications) and they can also be grouped according to what forms the policies have taken in practice according to a single principle of classification (a taxonomic approach). Our view is that while it is useful to employ classificatory approaches of measures that focus upon conceptual distinctions, in practice, the field of demand side policies is complex and at this moment in time a more pragmatic arrangement of the measures is needed that is based on existing understandings and classification approaches, hence we follow Edler’s typology (OECD 2011; Edler 2013; Peter, Bruno et al. 2013) and use a simple taxonomic method to grouping of the demand-side measures to create clear distinctions and more coherent categories of measures with which to work.

The taxonomy proposed in this study has four main types of measures: a) support and shaping of demand by the public sector (Public demand); b) shaping and influencing of private demand (Private demand); c) regulatory approaches (Regulations); and d) systemic approaches that combine measures of the other demand types and that support the supply side (Systemic approaches). In the table below, the four main categories of demand side measures are introduced.

Table 1: Demand Side Measures Typology

<u>Public demand</u>	<u>Private demand</u>
<ul style="list-style-type: none"> • General procurement (innovation as an essential criterion in the tendering and assessment processes) • Strategic procurement (the demand for certain technologies, products or services is encouraged) • Cooperative and catalytic procurement (public agencies purchase in connection with private demand) 	<ul style="list-style-type: none"> • Direct/financial support (demand subsidies and tax incentives) • Indirect/soft steering support (awareness building; labelling and information campaigns; training and further education; articulation and foresight; user-producer interactions)
<u>Regulations</u>	<u>Systemic approaches</u>
<ul style="list-style-type: none"> • Regulation of demand (to create a market; process and “usage” norms) • Regulation of the demander – producer interface (regulating product performance and manufacturing; regulating product information; supporting innovation-friendly private regulation activities) 	<ul style="list-style-type: none"> • Integration of demand-side measures (strategically co-ordinated measures which combine various demand-side instruments) • Integration of demand- and supply-side logic and measures (combination of supply-side instruments and demand-side impulses for selected technologies or services; conditional supporting of user-producer interaction; pre-commercial procurement)

Source: Authors adapted from Edler (2013)

The taxonomy introduced, whilst does not need further explanation, should not be considered in a rigid policy framework whereby a policy measure can be classified and restricted to only one typology. The demand side innovation policies considered are in fact spanning two or more demand-side types identified and, of course, span towards supply-side or systemic policy objectives as we shall see in the remainder of this brief review.

Bringing together the supply and the demand side of innovation

The remit of this study is to look at the intersection of supply and demand side of the innovation process, from the point of view of demand-side innovation policy. There is a great deal of overlapping and interrelation between demand and supply side as policies do not usually operate in a vacuum.

Bringing together the supply and the demand side policies as part of a more integrated approach is at the centre of a lively debate. Systemic approaches are attempts (1) to combine different demand side measures or (2) to combine demand and supply side measures and framework conditions. The basic idea is that (a) there are different needs and failures at play at the same time that need to be tackled by policy measures, that (b) needs for support change in different phases of an innovation (over time) or that different target groups have different needs for support.

Nonetheless, combining innovation policies either in mode 1) demand side policies, or in mode 2) supply and demand side policies, described above, presents several hurdles and a high degree of complexity. The complexity derives from interdependencies and interactions between different policy instruments implemented and the extent to which intended policy outcomes can be achieved (Flanagan et al, 2011). In other words, the outcome deriving from the combination of different policies, specifically supply side and demand side policies may imply a level of complexity that is difficult to assess ex-ante, in interim, or ex-post.

3. SYNTHESIS OF THE CASE STUDIES

3.1. Overview

The aim of this section is to summarise the twenty case studies representing demand side policies designed to promote innovation. Although finding perfect correspondences between the theoretical framework highlighted for this study and the policy measures considered is a complex task, the selected policies under scrutiny all address the idea that fostering innovation also means provide for its diffusion in order to improve on social and economic growth.

In this respect, the focus of the present section is the analysis of the relationship occurring between demand-side and supply-side innovation policies. This exercise contextualises innovation as the product of the simultaneous combination of technology push and market pull mechanisms. Accordingly, we look at different demand-side innovation policies and their implementation in terms of: public demand; private demand; regulations, and the overall systemic approach that demand-side policies produce on innovation diffusion, to then move on and analyse how they are combined with technology push instruments to maximise their impact.

Technology push strategies focus directly on research and development and innovation activities of the firms, whereby inventors create opportunities to satisfy consumers' needs. The market pull side conversely, thinks of innovation as deriving from people's needs expressed through market demand. From this rationale, supply side innovation policies focus on the role of research and technological development, the provision of a workforce trained in subjects such as Science, Technology, Engineering and Mathematics (STEM) and stipulations of opportunities for innovation to thrive. In policy terms these stipulations translate in the measures to facilitate access to financing innovative venture, publicly support venture capitals and loan guarantees. Examples are: entrepreneurship policies and all the support measures for exploiting intellectual property and technical services in order to foster efficiency and effectiveness of RTDI investments and translate scientific and technical knowledge into business propositions (Edler et al 2013).

The table below presents a synthesis of the case studies selected for the analysis in terms of content, beneficiaries and promoting institutions. The cases represent policies developed at different levels of governance: local, national, EU level as well as successful examples from Overseas (United States and Korea). In this way we aim at addressing how demand side policies are implemented at different levels and which differences it entails in their interactions with the supply side. Most of the policies taken into consideration are policies devoted to Small and Medium Enterprises and to emerging sectors such as: health, energy and food industries or defence. This latter element provides per se a first hint to the underlying relationship between supply and demand side in the design of demand policies, with sectors

selected on the basis of their technological (potential) push on the overall economy and the related legislator intention to increase the demand pull in order to diffuse innovation along both production (suppliers) and overall value chain (consumers and customers).

Table 2: Case Studies – Summary

Policy	Promoting Institution	Beneficiaries & Driving Factors	Description	Policy Type & Interaction
Small Business Innovation Research (SBIR)	Governmental Federal Agencies (United States)	SMEs and Universities Increase private-sector commercialization of innovations derived from Federal research and development funding	Award-based programme encouraging US Small businesses to engage in R&D with potential for commercialisation	<ul style="list-style-type: none"> • Demand side: Public demand; Public Procurement • Supply Side: R&D Commercialisation • Explicit Interaction
German (Solar) Panel Policy (Renewable Energy Heating Act and Market Incentive Programme)	Federal Ministry for Economic Affairs and Energy (BMWi) and Federal Office of Economics and Export Control (BAFA) (Germany)	Private individuals; enterprises; NGOs; and municipalities investing in renewable energy Foster the implementation of greener technologies	The policy seek to encourage the use of renewable energies in the heating process by obliging owners of new buildings to have a certain amount of renewable energy in their heating processes	<ul style="list-style-type: none"> • Demand Side: Private demand; Subsidies and financial incentives • Supply side: Technology push for solar energy • Implicit interaction
Smart Grid technology Standardisation	National Institute of Standards and Technology (United States)	Enterprises and Citizens Foster the implementation of greener technologies	The policy is part of a wider energy plan to foster the use of clean energy. It promotes interoperability standards which will enable the networked elements which make up the Smart Grid to communicate and work more efficiently	<ul style="list-style-type: none"> • Demand side: Regulations • Supply side: Investment grants and loans • Explicit interaction
Health Information Technology for Economic and Clinical Health Act (HITECH)	Department of Health and Human Services (United States)	Healthcare ecosystem: health care industry; health care providers; health care consumers Build the best conditions to promote the adoption of	The programme is designed to accelerate the adoption of health care technology and specifically of electronic medical records in order to enhance medical service delivery	<ul style="list-style-type: none"> • Demand side: Systemic approaches; Combination of demand and supply side instruments • Supply side: Related programmes targeting supply side factors • Implicit interaction

Policy	Promoting Institution	Beneficiaries & Driving Factors	Description	Policy Type & Interaction
		electronic medical records		
Defence-related R&D Procurement Schemes	Department of Defence (DARPA) (United States)	Enterprises and Universities Enhancing the development of research with military applications	A vast programme covering high payoff research with the aim of bridging the gap between fundamental research and its military application	<ul style="list-style-type: none"> Public demand: Strategic procurement Supply side: R&D funding and subsidies Explicit Interaction
Procurement conditioned SME R&D Programme	Small and Medium Business Administration (SMBA) (Korea)	SMEs Ensuring SMEs an access to capital funding for R&D	Zero-interests R&D funding to develop products. If successful products will be marketed, otherwise there is a no-collateral policy on the received funding	<ul style="list-style-type: none"> Demand side: Public demand; Public procurement Supply side: Measures to bring together SMEs; SMEs support (R&D subsidies) Explicit Interaction
New Technology Purchasing Assurance Programme	Small and Medium Business Administration (SMBA) (Korea)	SMEs Bringing SMEs and purchases together. Stimulate SMEs involvement in technology creation	Policy to stimulate technological development by SMEs via procurement from the public and private sector. It works in conjunction with the Procurement conditioned SME R&D Programme	<ul style="list-style-type: none"> Demand side: Public demand; Public procurement Supply side: Parallel programme to fund R&D Implicit interaction
Pre-commercial Procurement by NHS	National Health Service (NHS) (United Kingdom)	Enterprises Improving the service delivered by the National Health Service	Bespoke procurement scheme applied to: (1) identify clinical needs; (2) understanding the market positioning of the clinical needs; (3) contract firms to design, prototype and demonstrate their solutions; (4) evaluate and adopt the solution	<ul style="list-style-type: none"> Demand side: Systemic approaches; Pre-commercial procurement Supply side: Part of series of a package of policies designed to foster innovation Explicit interaction
Forward Commitment Procurement	Department of Business Innovation	Enterprises (with particular attention to	Originally developed to address the lack of market for environmental	<ul style="list-style-type: none"> Demand side: Public demand; Public procurement Supply side: R&D

Policy	Promoting Institution	Beneficiaries & Driving Factors	Description	Policy Type & Interaction
	and Skills (BIS) (United Kingdom)	SMEs) Satisfy identified public needs and enterprise development	innovations, today is more generally oriented in these sectors where there are demand-pull R&D efforts needed	support • Explicit Interaction
Innovation Procurement Scheme by the Ministry of Defence	Ministry of Defence (MoD) (United Kingdom)	Enterprises (with particular attention to SMEs) Enhancing the development of research with military applications	The aim of this policy is to drive innovation by generating and exploiting new technologies and services	• Demand side: Public demand; General procurement • Supply side: R&D joint plans for the supply side • Explicit interaction
Biometrics Standardisation	Department of Business Innovation and Skills (BIS) (United Kingdom)	Enterprises Interaction between standards and innovation in order to: support crucial emerging technologies; stimulate industrial development.	Align biometrics sectors with advances in technology and facilitate exchange of information with other countries	• Demand side: Regulations; Process and usage norms • Supply side: demand-pull action to identify solutions to emerging R&D technologies. • Implicit interaction
Danish Program for User-Driven Innovation	Business Innovation Fund (Denmark)	Firms; Public Organisations; and Research Institutions Collaborating with users to identify and act on innovation needs	Provide financial support in studying users or improve collaboration with users in order to identify and act on innovation needs in strategic sectors such as: design, welfare, health and food	• Demand side: Private demand; Integration of demand and supply side logics and measures • Supply side: Grants for innovative projects • Explicit interaction
Small Business Innovation Research Programme (SBIR)	Ministry of Economic Affairs (Netherlands)	Enterprises Increase innovativeness in the Business sector	The programme outsource the development of innovative solutions for socially relevant research particularly in logistic, renewable energy, care, security sector and food	• Demand side: Public demand; Catalytic procurement • Supply side: Funding high-risk innovation • Explicit interaction

Policy	Promoting Institution	Beneficiaries & Driving Factors	Description	Policy Type & Interaction
Small Business Research Initiative (SBRI)	Technology Transfer Board (TSB) (United Kingdom)	SMEs Connect public sector challenges with innovative ideas; SMEs development	It is a multilevel initiative (national and regional) involving various departments. It is a public procurement scheme developed in order to provide innovative solutions to challenges faced by the public sector	<ul style="list-style-type: none"> • Demand side: Public demand; Public procurement • Supply side: R&D support • Explicit interaction
Top Sectors Initiative	Ministry of Economic Affairs (Netherlands)	Enterprises Foster international competitiveness	Industrial policy focusing public activities and resources in the nine top sectors in which the Netherlands excel globally. Main objective are: to leverage private sector R&D; create a greater coherence in supporting businesses tailoring the policy to specific sectors	<ul style="list-style-type: none"> • Demand side: Private demand; Direct financial support • Supply side: Series of funding instruments such as knowledge vouchers, support hiring experts, R&D grants, networking activities and innovation brokers • Explicit interaction
Green Energy Innovation Incentives	Ministry of Economic Development and Ministry of the Environment (Italy)	Enterprises Foster the implementation of greener technologies	National policy to promote the use of renewables in electricity production.	<ul style="list-style-type: none"> • Demand side: Private demand; Direct financial support • Supply side: Complex set of extended incentives • Explicit interaction
Transformation of the Greater Manchester Waste System	Greater Manchester Waste Disposal Authority (United Kingdom)	Enterprises Foster the implementation of greener technologies	Public procurement policy to substitute landfill waste practice with state of the art technology for waste separation, recycling and composting	<ul style="list-style-type: none"> • Demand side: Public demand; General procurement • Supply side: Funding for the acquisition of new technologies • Explicit interaction

Policy	Promoting Institution	Beneficiaries & Driving Factors	Description	Policy Type & Interaction
European Innovation Partnerships	Directorate General for Research and Innovation (European Commission)	National, regional and local stakeholders along the whole research and innovation chain Foster international competitiveness	Policy working across supply and demand focusing on societal challenges and the modernisation of the associates sectors and markets	<ul style="list-style-type: none"> • Demand side: Systemic approaches; Integration of demand and supply side logics and measures • Supply side: Complex and integrated set of policies and actions to leverage on demand side elements to foster development across the whole value chain • Explicit interaction
Lead Market Initiative	European Commission	National, regional and local stakeholders; EU citizens Foster international competitiveness	The policy targets six strategic sectors in order to lower barriers to the market & increase the number of products and services available	<ul style="list-style-type: none"> • Demand side: Systemic approaches; Integration of demand side measures • Supply side: Complementary actions to support financial and innovation related services • Explicit interaction
SMEs Standardisation Initiative	French Ministry of Economics and Finances, Directorate General of Competitiveness, Industry and Services	SMEs SMEs' international development and competitiveness	Provide financial assistance to intermediary organisation representing SMEs in order to participate to standardisation committee at the EU level	<ul style="list-style-type: none"> • Demand side: Private demand; Direct financial support • Supply side: Financial support • Explicit interaction

The next figure (Figure 1) captures the dynamics between supply and demand side innovation policies contextualising them in relation to the type of demand side measure adopted (Public demand; Private demand; Regulations; Systemic Approaches) and the level of interaction with the supply side policy (explicit or implicit).

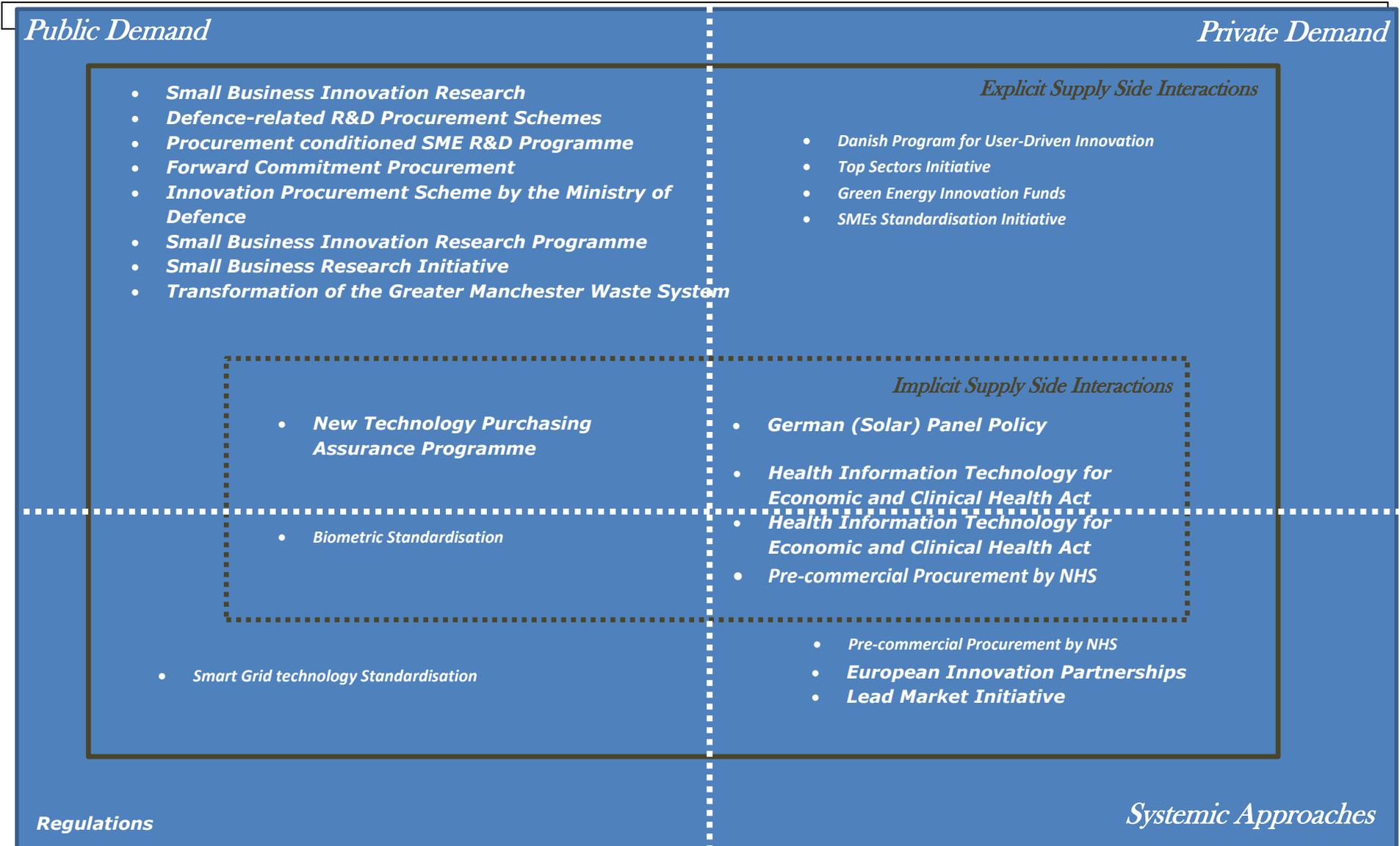
In the picture emerging from the case studies analysis Demand and Supply side policies are never meant to be having effects in isolation. Moreover, they fit in a policy landscape where their relationship is either explicitly designed or implicitly accounted for by other (Supply side) satellite policy actions.

We define explicit interaction between Supply and Demand side policies these cases where a Supply side instrument (associated to R&D funding) is purposely designed in conjunction with the Demand side action in order to exploit the Demand-pull to Technology-push effect of the policy combination. Examples of those are the Small Businesses Research Initiative or the Green Energy Innovation Funds

or the Smart Grid Technology Standardisation where grants and incentives have been designed along the Demand side instrument in order to pursue a higher penetration rate in the consumers and/or supplier firms market.

As well as explicit examples of interactions, some of the case studies analysed look at the implicit interaction which might occur between demand and supply policies. Specifically, we define implicit interaction between S&D a situation where the S&D policies are not nested into each other according to a direct plan but are interacting via the wider policy framework where both are embedded as separate but complementary elements. In our study, this is true for policies encompassing comprehensive objectives which are touching up to the society level of action, such as Health Information and Technology for Economic and Clinical Health Act, or the Biometric Standardisation.

Figure 1: Case Studies: Supply and Demand Side Policies Interactions



This reflects the idea that a policy mix is always in place either explicitly (directly) or implicitly (indirectly) at every level of governance and where the system configuration depends on the wider (innovation) system of reference, where policies are interacting in order to reach multiple objectives, actors and beneficiaries at once (Flanagan et Al. 2011).

As summarised in Figure 1, the relationships across the policy space emerging from the twenty case studies is diverse in terms of nature and instruments applied.

The majority of such policies entails the implementation of Public procurement with the technology push promoted by a Public demand action. Many of the initiatives in this spectrum concern Small and Medium Enterprises due to their importance and frailty on the global industrial landscape. SMEs are targeted with explicit (Public demand) instruments and a strong emphasis in the SMEs programmes is devoted to maximise the interactions with R&D polices on the supply side.

Two sectors emerge as particularly relevant in terms of S&D interaction: Health and Defence. Although both the sectors are critical in terms of their wider impact in the society, the implementation of actions for the two industries follows different paths. Whereas for Defence the design of the policy landscape requires a clear definition of all the actors involved, and hence the supply side is by definition nested in the design of the demand side instruments, for what concern the Health sector the policy mixed is more nuanced. Particularly, in the case of Health the analysis highlights a more complex framework where the demand pull aspect is well defined but not as well as for embedding the supply side. The breakdown of both policies shows a scenario where the supply side is addressed indirectly: by targeting specific supply side factors with satellite programmes (as in the case of HITEC and the SHARP programme); or by fostering the diffusion of green technologies (as in the case of the German solar panels policy).

The interactions generated by Private demand-oriented instrument instead appear to be clearly focused on developing explicit framework of interaction between S&D policies. This is due to the nature itself of the Demand policy at hand which calls for steering or direct financial support as in the case of the Top Sectors Initiative or SMEs Standardisation initiative respectively.

The same clarity of framework is applied also where Systemic Approaches are put in place in order to spur innovation from S&D interactions. As the objective of these policies is to reframe sets of industrial policy priorities at the EU or National level, their depth and breadth involve all the actors in the beneficiaries spectrum, and the instruments implemented are accordingly explicitly designed in combination for the demand and supply side (with the exception early discussed of the Health Information Technology for Economic and Clinical Health Act).

To conclude this section it is perhaps the case to underline that the classification it represents is based on our effort to translate theoretical and analytical frameworks to the operationalisation of existing policy measures that evidently have more than one objective and which are not limited in the domain of demand side policy. Moreover supply-side objectives might even be implicitly integrated within the policy design. Therefore the classification presented is addressing the need stated in our mission to unpack the demand side innovation policies reviewed keeping in mind that their objectives (implicit or explicit) are referring to the supply side of the Innovation process and that their implementation involves factors other than the demand for innovation for which they are commonly classified.

3.2. Impact assessment of the 20 case studies

Few of the 20 interventions selected as cases studies have been subject to impact assessments². In some cases this reflects their relatively recent introduction and the intention is to evaluate in the future, but it also reflects the inherent complexity of these interventions. They are complex for the same reasons which apply to any policies or instrument/tool designed to stimulate innovation; including the often long timescales to economic impact and the difficulties of separating policy outcomes from the activities of others in the innovation process. But there are additional reasons for complexity:

1. To varying degrees, the 20 case studies are combinations of supply and demand-side interventions. None of the information we obtained on evaluations sought to disentangle the relative importance of supply and demand-side measures. This would be difficult because in most cases because both types of support are offered within a single programme so it is not, for example, possible to compare participants which have benefitted from one type of support with those which have received another. Indeed, it appears that the success of some

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2. We would note that at least one intervention has been evaluated but the results are not publicly available.

programmes is in part due to the successful combination of supply and demand-side measures;

2. A related point is that many of the case studies combine more than one type of demand-side intervention. For example, some of the standards and regulations interventions also include awareness raising campaigns and the Korean New technology Purchasing Assurance Programme indemnified procurers against non-performance as well as articulating demand to suppliers. So far as we are aware, none of the 20 interventions sought to disentangle the effect of different demand-side measures;
3. It is very difficult to identify the 'counterfactual' and therefore assess what might have happened without the intervention. Ideally, this is done by identifying a control group of non-participants or adopting some quasi-experimental approach and comparing the behaviour and development of participants with the control group. However, in some cases, for example standards and regulation, the results of the intervention will impact on all businesses in a sector and a control group cannot be identified. In others, the difficulty is in finding non-participants which are similar in other ways to participants. As is discussed below there may be scope to do this, but many programmes involve some element of competition between applicants so that participants may be higher performers. In addition, sampling a control group creates difficulties in securing responses and adds to evaluation costs.

Instead of impact evaluations, assessments of the interventions have focused on process evaluations and monitoring data. Several, especially in their early stages, have through expert panels and surveys of participants and non-participants considered whether programmes are developing as intended and have recommended adjustments as appropriate. Some interventions seem to have evolved over many years in this respect. Monitoring data is, of course, collected by all, but tends to focus on activities rather than outputs and outcomes; for example, expenditure, number of firms involved and more specific measures related to the programme, such as share of procurement budgets.

Some programmes have also collected data on intermediate outcomes which could be used to inform an assessment of economic and other impacts. The most common, which obviously reflect programme aims, are:

1. Employment (and growth) of participating firms;
2. Sales and growth;
3. R&D and growth;
4. Profitability and growth;
5. Various measures of innovation related outputs, notably patents.

As noted above, it is very much the exception for these metrics to be developed into economic impact measures, or for assessments of what would have happened without the intervention. It is, however, worth noting two (partial) exceptions. One of which is one of our case studies³. The US Small Business Innovation Research (SBIR) programme is an early example of demand and supply-side intervention which has since been adopted by several other countries. Because of its long history and profile it has probably been more extensively evaluated than any other measure and it is one of the very few in our sample where econometric methods have been used to assess counterfactuals. Interestingly, these studies are not unanimous in their conclusions. Some studies which compared SBIR participants with a control group of non-participants found a positive and significant impact on sales and employment. Another, which adopted an instrumental variable approach to correct for omitted variables, found no effect on employment and that the SBIR grant crowded out privately-funded R&D.

3.3. A methodology for impact assessment

This section presents suggestions for impact assessment and evaluation rather than detailed approach or writing a manual. The suggestions are grounded in conventional evaluation approaches and we believe this is especially important given the complexity of the programmes. In addition, we believe that evaluations should throw light on why an intervention has (or has not) worked and whether it might be transferable as well as evaluating impact. This general approach incorporates elements of Theory Based Impact Assessment (TBIA)⁴. We would emphasise that this does not exclude rigorous and quantitative approaches where appropriate including the use of control groups.

3 The other, NESTA's Creative Credits, is discussed in the next section.

4 For a discussion of TBIA, see THEORY-BASED EVALUATION DG Regional Policy http://ec.europa.eu/regional_policy/information/evaluations/pdf/impact/theory_impact_guidance.pdf

The starting point for any evaluation should be a logic model of how the intervention (or combination of interventions) is expected to ultimately generate impacts. More specifically this should contain statements of:

1. The rationale for intervention. This is not simply a statement of why something needs to change but what are the market/system failures which justify public intervention;
2. Objectives – what the intervention is seeking to achieve;
3. Inputs – financial and other;
4. Activities, for example purchasing products or increasing awareness, which will be undertaken by the intervention;
5. Outputs, for example innovative products in the case of procurement policies;
6. Intermediate outcomes, for example increased R&D by participating firms, new services provided with the new products by the purchaser;
7. Final outcomes, for example, improvements in business performance, diffusion of new products and services;
8. Theories of change underpinning these statements and the transition from rationale through to final outcomes.

An illustration of a logic model for interventions to promote standards is given in Appendix A. The logic model enables research questions to be posed and potential metrics and indicators to be identified. If this is done before the programme begins it facilitates the collection of data, especially relating to pre-intervention baselines. But logic models can be constructed retrospectively. It goes without saying that the metrics to be collected and analysed will vary from programme to programme.

The specific techniques to be adopted will depend on the nature of the intervention, but we would note the following points. First, despite the difficulties mentioned above there may be potential to identify control groups or other quasi-experimental methods. For example, if competitive programmes are oversubscribed there are likely to be non-participants which are similar in important respects to participants. If so the control group can be compared with participants through the use of techniques such as difference in difference and discontinuity regression analysis⁵. The evaluation of Nesta's Creative Credits programme (not included in the case studies) in the UK adopted an interesting approach to control groups. This provided vouchers to firms to use for assistance with innovation projects. Beneficiaries were selected by lottery from applicants meeting certain criteria and successful and unsuccessful applicants were compared, mimicking randomised control trials in medicine⁶. Clearly such an approach is only possible, and acceptable, in certain circumstances.

Second, the resources devoted to evaluation should be proportionate to the intervention. In practice, this means focusing on areas which are expected to be especially important and which can be addressed meaningfully. The logic model also provides guidance in this respect. However, it may be appropriate to devote relatively more resources to new and innovative interventions where learning lessons is especially important.

Finally, despite the rigour that control group-based approaches offer, most evaluations will have to draw on self-reported benefits by participants. In part because of the methodological and cost issues but also because of the importance of learning lessons as to why interventions are successful or not. To illustrate, if a perfect control group was identified and the evaluation found successful intervention this would only tell us that the intervention works for that kind of participant and not whether it could be transferred, or improved.

3.4. Preliminary Policy lessons

As illustrated in the previous sections, the twenty cases studies present a large variety of cases and implementation of complex situations. It is thus challenging to identify generic lessons that apply across all the various cases. Nevertheless, from the review of the cases it is possible to identify some key factors that shed light on some of the elements of success or failure associated with these policy initiatives and programmes.

Demand side policies appear to be more efficient when coupled with supply-side aspects. This appears of particular relevance when the objectives of the policy deal with behaviour changes for the final beneficiary (for example, for the promotion of green energy or standards). Public

5 These and other evaluation techniques are described in many guidance manuals. See for example: The Magenta Book, HM Treasury, <https://www.gov.uk/government/publications/the-magenta-book>

6 Bakhshi, H, Edwards, J., Morley, L. Roper, S., Scully, J., and Shaw, D. (2012): "An experimental approach to industrial policy evaluation: the case of Creative Credits"

procurement alone is not sufficient in itself to create a “windfall effect” and there is a need to support directly enterprises (supply side) which will apply to the procurement processes, in particular when R&D activities are still requested. Furthermore, this aspect is also important to secure or encourage the behavioral change targeted by the policy by creating the necessary transforming of suppliers and upgrading the skills and competencies of an entire sector (the innovation fostered by the policy becomes the standard for the entire sector). Without sufficient supply incentives, there is a risk regarding the take up and use of public resources or investments (for instance in terms of infrastructure) and a risk that enterprises develop competing projects.

Furthermore, public procurement coupled with supply side incentives (grant or loan) appear as an interesting method for funding R&D for enterprises and present the advantage of no dilution of ownership or repayment for SMEs in comparison with other means such as business angel and venture capital investments. It also appears as a good method to attract other public or private funding (snowball or multiplier effect). Moreover, several cases (e.g. the American SBIR case) have proven to be successful in fostering the development and adoption of technical innovation. Public procurement plays a role of in certifying firm quality as they validate technology concept and commercialisation. It is of particular importance to foster the emergence of new markets. Furthermore, businesses respond very favourably, since they receive a contract (rather than a subsidy) which implies better engagement from them to satisfy a client and an obligation to deliver results. This results in a higher priority within the firm.

Aside from the mix and interaction between demand side and supply side aspects, a clear and precise analysis of the innovation ecosystem appears as a key success factor. In particular, involved stakeholders should participate in designing the policy based on their own needs and the perceived market failure. This analysis allows policy makers to identify the necessary bridges to be built between stakeholders and the marketplace. Stakeholders should also ideally be associated with the policy dimension (especially regarding the amount of grants or loans, but also the necessity of support SMEs in their projects). This is of particular importance when the domain targeted by the policy faces resistance to change or forms part of the current identified societal challenges (for instance health). Establishing a dialogue with stakeholders and declining the overall policy in a set of specific measures for specific stakeholders to take account their own needs appear an efficient route to address specific issues. The cases illustrate different ways to organize such a policy dialogue: through holistic approaches (eg Hitech case) or via open collaboration frameworks (eg Pre-commercial Procurement by NHS in UK). But the key success factors relies more on the quality of analysis and the coordination and animation of the dialogue itself than on the way to organize it, dependent on specific situations, context and stakeholders. In particular, identifying users’ needs might be a necessary (or at least valuable) input into successful innovation policy development but it is not on its own a sufficient condition. Thus, critical success factors include:

- 1) The identification and articulation of unmet demand;
- 2) A commitment to meet the unmet demand;
- 3) Tenacious and committed project management;
- 4) Provide a role of intermediation and brokerage;
- 5) Adapt the way that procurement is (normally) planned and implemented (i.e. innovative approaches to procurement).

The last success factor identified deals with the issues of administrative constraints. Small and flexible schemes appear more able to achieve targeted results and involve SMEs more readily. Low barriers for participation and low administrative burdens are perceived as key elements for enterprises. Furthermore, the complexity and the duration of the application process can also be an issue when involving enterprises, especially for small firms with constrained monthly cash flow.

The question of the dimension of the policy (mainly supply side aspects) appears complex. As mentioned above, creating a success or windfall effect is a critical factor to generate results and create sufficient incentives. But determining the amount of grant or loans and the timescale requested is dependent on multiple factors. Cases studied suggest the need for flexibility to adjust over time, based on the evolution of needs. In general, drivers and environment are important aspects to be taken into account and it’s hard to generalize how to manage them. The difficulty of attributing causality, especially when dealing with instruments designed to improve the market environment is recognized. Monitoring and evaluation are good means to adjust in time and better understand how the environment is impacting the policy results. However, there is often no single policy measure that could remove the barriers that block the emergence of strong demand in markets. Only a combination of different public measures and incentives can make a difference and consequently this is an area where the transfer of experience and good practice are particularly relevant.

4. PROPOSAL OF FIVE CASES FOR IN DEPTH ANALYSES

This section presents the rationale to select five cases for in depth analyses. The purpose is to draw-up lessons learned from impact assessment of demand-side policies and the role of the interconnections with supply-side policies to produce wider effects on innovation systems. The cases studies will thereby focus on shedding light upon both the Supply and Demand side mechanisms available to the policymaker when designing and implementing the policy measures and how the interaction has played out during and after the deployment of the policy measures.

The proposed framework of analyses will include the following sections:

Objectives: this section will aim to develop a better understanding of the interaction between demand side and supply side factors, how the interactions were either designed in the policy or emerged whilst the policy measure was active and if and to what extent further supply-side factors have been developed during the implementation and deployment of the measure.

Output and outcomes: This section will look at behavioural change during the policy implementation and deployment stage, results in terms of innovation (in products, processes and new organisational arrangements) and follow ups innovation activities (and market success)

Wider effects on the innovation system: This section will summarise those factors that emerged from the application of the policy measure that have a more long-lasting effects on the innovation system.

Conclusions: The conclusions will be presented under two main headings: 1) Interaction of supply side objective in demand –side policies and 2) Contextual and specific factors which influenced the outcomes.

The selection of the five cases studies has been done according to the following criteria:

- Geographical coverage. In particular, US Cases are interesting since in US context, there has been a tendency to focus on the supply-side leaving the private sector to address demand-side issues. Analyses the rationales to change mind is thereby of interest for the study.
- Scope and reach of the policy(ies)
- Conceptual relevance (demand/supply interaction)
- Stakeholders involved in the policy and their supply/demand stand
- Age of the policy and availability of evaluation material
- Stakeholder/Users’ involvement and engagement in the policy design phase.

Based on the overview of the twenty previous cases that have been presented to the project steering committee on the 9th of July, the following five cases were approved for in-depth analysis and the preparation of detailed case studies:

- Small Business Research and Innovation (US/UK/NL)
- SME Standardisation Initiative (FR)
- Green Energy Innovation Fund (IT)
- Greater Manchester Waste System (UK)
- HITECH programme (USA)

Regarding the first case, it will be a hybrid case study and mix elements of the three national SBRI initiatives. The fifth case will focus on user’s engagement as this programme explicitly addresses user-engagement in far more depth than any of the others. One strand of the overall programme is called “*Consumer eHealth Program*” which comprises the following (each of these is also comprised of sub programmes and initiatives):

1. Consumer eHealth Program. The Aim is the empowerment of individuals to improve their health and health care through Health IT
2. Patient-Generated Health Data. ONC has identified PGHD as an important issue for advancing patient engagement and initiated a series of activities to gain more information about its value and approaches to implementing it.
3. Person at the Center. To support a paradigm shift over the next few years to facilitate effective health management by individuals, their caregivers, and their health care teams

The five cases will be provided in the second policy brief and will serve as a basis for discussion during the workshop which will be held on 14th of November 2014. The case studies will build on the initial research and will be reinforced with interviews with those responsible for the design, implementation and evaluation of the policies and tools.

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This first policy brief presents an overview of the wide set of demand and supply side innovation policies both within the EU and elsewhere in order to identify, classify and characterize the various measures implemented in different contexts and their combination. It is based on a detailed literature review of demand and supply-side innovation policies and the analysis of 20 international cases of innovation policies, instruments and tools selected as representative of good practices to address demand side and/or to combine or interact with supply side approaches.

Studies and reports

