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Measuring Public Sector Innovation

Why, when, how, for whom and where to?

This discussion paper is seventh in a series of studies looking at the innovation lifecycle. The working paper covers the state of the art in the field of measuring public sector innovation and proposes some ways forward.

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Executive summary

The current discussion paper accompanies the fifth public sector innovation lifecycle study on innovation evaluation funded by the European Commission under the Horizon 2020 grant number 671526. While measurement is often mixed up with evaluation, the two have distinct goals. While one tries to assign numerical measures to inputs, processes, outputs and impacts, the other takes the form of a systemic assessment of causal relationships between intervention and change. Thus, measurement and evaluation should be mutually reinforcing, but they should not be seen as interchangeable entities.

Measurement systems, indicators and metrics in the public sector are becoming increasingly complex, yet, they do not *a priori* say that public sector's activities lead to change; they serve as descriptive tools, feedback measures and alarms for the need of further control and assessment. Yet, in many cases, measurement becomes the proxy of evaluation. This in context of innovation (and probably also elsewhere) should be avoided or at least critically examined – quantitative measures by design simplify and thus, they serve some goals better than others. Generalisability, comparability and uniformity seem to rule over usefulness of measurement towards different types of innovation and user needs. Hence, the paper argues that there is a need to go back to basics and start to link public sector innovation measurement better with its different purposes and user needs; so, that 'why' measure public sector innovation does not get lost in 'what' can be measured.

In developing the argument, the study reviews the experiences of previous public sector innovation measurement efforts and the influence of economics, management theories and private sector innovation on this work. Here the Oslo Manual has had a widespread influence, both positive and negative. The lack of a market or a 'price measure' of public sector innovation has meant that effectiveness, efficiency and impacts of innovations in the public sector are rarely if ever studied and mostly reliant on self-reported data and individuals' perceptions. Most measurement efforts have relied on survey methodologies and been good at testing and describing a variety of factors connected to the 'success of innovations'. Yet, how these factors are linked to each other, how they change over time and the size of their influence is not examined. Nevertheless, public sector innovation measurement is far from a blank slate – there are plenty of learnings to be gleaned in prior efforts. Yet, the fundamental contradictions of technology, change and productivity dynamics of the sector will not make any measurement effort easy. Far from it.

What is, however, needed now for a qualitative jump in public sector innovation measurement, is a public sector specific conceptual framework that differentiates between different types of public sector innovation based on its directionality and uncertainty. Different types of innovations or innovation facets – adaption, missions, enhancement, and anticipation – need varying support and conditions and thus, uniformity of measurement systems may be actually hurting specific innovation efforts.

In addition, the 'positive' prism of innovation is still prevalent in the public sector – innovation is seen as something that is always beneficial. This assumption should be

refuted, because it stands in the way of meaningful measurement systems that act in a sentinel manner. Innovation does not always make things better, it can make things worse for different people and introduce considerable value shifts and public sector measurement systems should capture the former.

Last, but not least, digitalisation is introducing fundamentally new ways of measuring different phenomenon in the public sector. More experimentation with big data, machine learning, social media scraping and crowdsourcing/coproducing information should become the norm in public sector innovation measurement. One cannot study innovation, but negating change and new ways of learning. What is certain is that public sector innovation measurement should always be in flux – simply put, the past is not the predictor of present of the future, especially when it comes to innovation.

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1. Introduction

This working paper is part of a series of studies on public sector innovation lifecycle funded under the European Commission's Horizon 2020 program. Previous studies have covered the following innovation lifecycle portions: identifying problems, generating ideas, developing proposals, implementing projects, evaluating innovations and diffusing lessons. Measurement is not seen as a separate part of the lifecycle – so, why make it distinct from evaluation? First and foremost, because the two are not the same: measurement is usually numerical (a number is assigned to a characteristic of an object or event that can be compared to other similar objects or events); evaluation, however, is a broader judgement or assessment of value or amount that can use measurement as input. Yet, measurement often becomes a proxy for evaluation in the public sector. Metrics in general are extremely important in the current public sector performance management systems. The number of indicators are increasingly growing; and once institutionalised, they are proving to be very difficult to remove. They can, thus, become a source of government overload (Lewis and Triantafillou, 2012) and cause confusion about priorities (Micheli and Neely, 2010).

At the same time, as discussed in the fifth lifecycle study on evaluation (OECD, 2019), the evidence base for the success or failure of public sector innovation is mostly composed of case studies. They are difficult to compare to other settings, they have high internal validity, but low external validity and generalisability. As such, thick descriptive of innovation capacity may be more meaningful, but these are costly and might not lend themselves to generalisability. Thus, case study evidence is often described as 'anecdotal' (e.g., Jin and Osborne, 2017; Bornis, 2018; Carbonara and Pellegrino, 2018; Bianchi, Marin and Zanfei, 2018). To be sure, there is a positive bias in the evidence base as only successful innovations tend to get reported on (Edgerton 2007; Kelman 2008) and all analysis carriers a certain element of subjectivity. Thus, in terms of measurement quantitative indicators are generally preferred because of comparability and heightened credibility. Thus, different quantifiable measurement efforts mostly based on survey-based analysis have sprung up (e.g., Bugge, Mortensen and Bloch 2011; Hughes, Moore, and Kataria, 2011; Arundel and Huber, 2013; COI, 2015; Arundel, Bloch, and Ferguson, 2018). In the case of the Nordic countries and the Innovation Barometer they are showing signs of institutionalising. Thus, the window of opportunity to influence the inevitable – the measurement of public sector innovation – is closing.

Is this bad? Yes and no. In recent years, public sector innovation has become a popular topic for research. There are plenty of systemic reviews rigorously outlining the different factors and characteristics that influence the occurrence of innovation, its sustainability and impact (De Vries, Bekkers and Tummers, 2016; Zhu and Andersen, 2018; Cinar, Trott and Simms, 2019). These include individual, organisational, environmental factors and characteristics of innovations themselves. There are even excellent accounts of innovation measurement attempts themselves (Kattel et al. 2013; 2018; Arundel, Bloch and Ferguson, 2016; 2018; Nasi, Cucciniello and Degara, 2018) outlining the logics behind measurement efforts and the successes, shortcoming and biases of different

measures. Nevertheless, what is in general missing are the interconnections between the variables (how are the variables interlinked and how influential different components are to innovation success and under which circumstances the conditions apply); furthermore, most studies are cross-sectional, thus, they invariably neglect the importance of time. This is crucial for innovations, because plainly put: innovations stop being innovative over time. In addition, current measurement efforts have been characterised by an overreliance on economic theories, private sector experience (Kattel et al., 2013) and general lack of public sector specific theory of change. Thus, the field of public sector innovation has grown substantially, we know list and lists of factors that may influence innovation outcomes, but there is very little knowledge about when and connected to which types of innovations they apply and if the past experience can be extrapolated to the future occurrence of innovation. In the case of innovation, past can be a very poor predictor of the present or the future.

Thus, the logic of the public sector (and to be sure international organisations) is to develop indicators and comparative measures, it is not entirely certain that in the current format and with the knowledge base it is possible to develop good metrics that are beneficial for innovation practice for the long term. Yet, even with these reservations, indicators will be developed regardless; and once in existence, they will be very difficult to remove. Lock-in can be however detrimental in current circumstances where technological development and use of Big Data present an array of new ways of measuring both policy problems and policymaking – the Moneyball of public sector innovation (see Kattel et al., 2015) – that are largely in the public sector unexplored and untested. Hence, an experimental, iterative approach to public sector innovation measurement under current circumstances would be best.

Furthermore, if the general assumption is that by the nature of innovation (change and uncertainty) there will never be a perfect measure for innovation that allows to make future-oriented decisions, this discussion paper proposes that the understanding about the utility of measurement should improve. So, that indicators do not become proxies of deeper understanding and evaluation, but one of many sources of information. There, for example, may be need for easily communicable 'sentinel indicators' (signals of further investigation) rather than direction measures (Britt and Patsalides, 2013). This may also mean using preliminary data analysis for measures and outlooks (probable, desirable and undesirable scenarios and potential outcomes of optional actions) in combination with measurement. In some occasions shifting from 'what' to 'how' in the case of innovation may also more important (Bason, 2018). But, first and foremost, the utility of measurement itself should be discussed.

1.1. What is measurement good for anyway?

There is no such thing as a perfect measure. The value of indicators and measurement cannot be looked at separately from their intended use. As there are different users of metrics, their needs also vary. Hence, the utilisation of indicators is what gives them value. The following uses for measurement have been previously identified (Gudmundsson, 2003: 4):

- they can be used for *providing information* (descriptive data about what is going on without distinct value judgements);
- *monitoring (*regular feedback information which can be both descriptive, but also evaluative – e.g., performance data);

- and *control* (how reality matches the expectations and norms about e.g., resource allocation). Under control, indicators can also bring about punitive action, e.g., sanctions.

Thus, while indicators should always strive for some quality characteristics (agreed, exhaustive and exclusive definitions; sensitivity to significant change; maximal validity and reliability; comparability; evidence-base etc.) its optimal specificity and content may differ based on the purpose they serve.

From an instrumental perspective indicators can be used for communication and awareness raising, monitoring and evaluation of performance, supporting policy evaluation and policy analysis, early warning, political advocacy, control and accountability, transparency, and improving the quality of decisions (Lehtonen, 2015; see also Table 1). Indicators can set targets and become established standards and thus, also send signals about the quality of the products or services.

Table 1.1. Functions of performance indicators

Purpose	Questions performance indicators can help answer
Evaluate	How well the organization is performing?
Control	Whether the employees are doing 'the right thing'?
Budget	Which programmes, people, or projects will be allocated funding?
Motivate	How to inspire staff, mangers, citizens, and so on, in order to improve performance?
Promote	How to convince external stakeholders that the organization is performing well?
Celebrate	Cause for celebration of success
Learn	Which measures and activities are successful/unsuccessful?
Improve	What measures can improve performance?

Source: Lehtonen 2015 based on Behn 2003.

In terms of content, indicators in general can be descriptive, performance-oriented or composites (Lehtonen, 2015). They can be dichotomous, number, grade, time series, or ratios or other derived functions. While descriptive indicators try not to make distinct value judgements, performance indicators are by nature aspirational (they compare the existing value to a standard or target). This is the basis of traditional ranking systems that benchmark performance, create accountability and act as aides to resource allocation. Composites aggregate series of individual indicators into few or one number-based values relying on an underlying model that that explains the nature of the multidimensional concept. In this way, they give the 'big picture' within a policy field that is accessible to a wide range of audiences, but they do not identify causal relationships nor provide – in most cases – sufficient knowledge for specific policy decisions (Grupp and Schubert, 2010). Similarly, some indicators can become 'headline indicators' (Patterson, 2002) for their field as they communicate concisely the general level of progress within a policy field.

In essence, indicators at their core simplify and facilitate communication around objectives; they are communication devices that should lead to further enquiry. Yet in practice, they start to have attributes that are characteristic to evaluations; and they can be overpromised as tools for learning and improvement. However, it does not mean that indicators cannot be used in inductive or deductive approaches to analysis. Thus, they can be used as inputs to either test theory or hypotheses or they can be used to gather data to

build theory itself. Thus, they can be used for both design and implementation of policies, but also as inputs for evaluation and monitoring. These are contradictory goals – rarely if ever can indicators serve all these purposes at the same time. Consequently there are several trade-offs when designing indicators that need to be taken into account (e.g., Rosenström and Lyytimäki, 2006). These include:

- They can test the theory of change or evaluate it;
- They can be either descriptive or prescriptive;
- They can aim for objectify or normativity (quality standard);
- They can serve scientific quality or have practical value;
- They can describe the complexity of the situation or serve as more simple communication devices;
- They can cover robustly long-term effects or be timely to the everyday decision-making process.

Similar to evaluations and other accountability measures, indicators are also discussed in different forums. For example in the public sector innovation context, four selection environments or feedback forums have been identified: the public or citizens, market, policy network and hierarchical politico-administrative processes (Lember, Kattel and Tõnurist, 2018).

1.2. What makes measurement 'meaningful'?

First and last, meaningful measurement is *purposeful*. Measures are created based on the purpose they serve to either control and demonstrate that right action and direction has been taken, thus, creating legitimacy into the process; or to provide general descriptions about the phenomenon at hand or direct feedback about the success of tested measures to those who are implementing policies and initiatives. Based on the purpose and function of measurement also the target groups and users of such measures are different. Different data users have different needs (based on the timeliness, accuracy/specificity, complexity etc. of the data).

Meaningful measurement, thus, identifies potential data users and their respective needs. Policymakers may need to have information about the future development potential in the area or assess the need for change; while organisations implementing projects may need fast feedback and complex monitoring tools that do not oversimplify the problems they face. The general public may require much more simple data about the success or failure of initiatives that is easily communicable and effective in eliciting constructive responses (demand for change; creation of trust in the policy field etc.). Academia and research community as additional users building on the indicators and developing new theories of change, may need much more specific and robust information. Thus, indicators based on user needs and goals of measurement may land on varying reams of the efficiency-legitimacy continuum (table 1.2.). What tends to happened in practise in the field of public sector innovation is that most measurement efforts rely on satisfaction surveys or perceptions at most and do not address broader legitimacy needs in the public sector.

Table 1.2. Logic of efficiency vs legitimacy

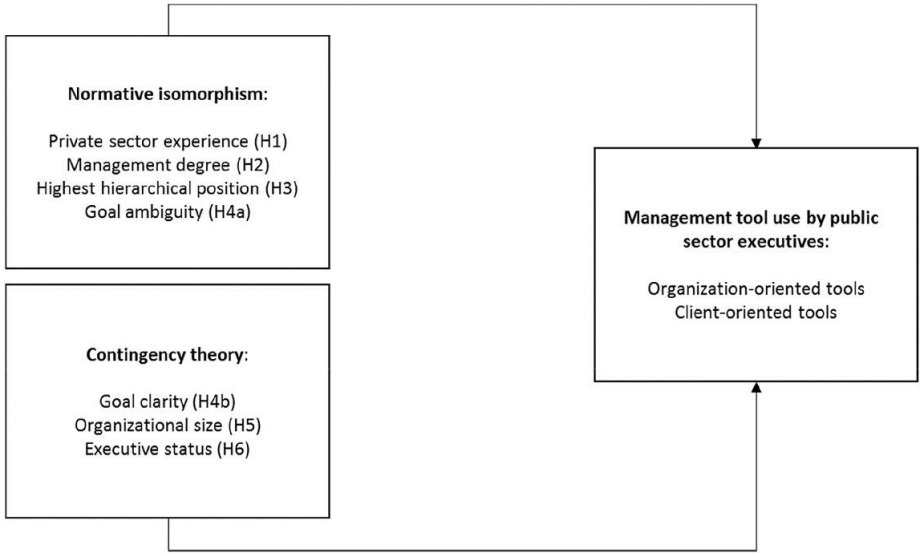
Efficiency	Legitimacy

Input/output productivity	Performance measurement (outputs, outcomes etc.)	Self-evaluation tools (e.g. EFQM excellence model etc.)	Satisfaction surveys, trust surveys	Real-time (social) media watch

Source: Kattel et al. 2018

The needs and purpose of measurement pre-define also measurement design. For example, the unit of analysis (individual, project, organisation, agency, sector, country) should be selected based on the problem and the needs of the users of the data: on what level the users can use indicators to make decisions and choose their actions based on the data. For example, recent research starts to differentiate the use of management tools and measurement in the public sector based on among others executive statuses, organisational size and management degree (see figure 1.1.). Furthermore, public sector managers have not traditionally been taught how to innovate, thus, one cannot assume that there is capacity and skills to do so. Measurement as a descriptive gauge can identify what skills have been learnt and which aspects of the innovation toolbox are most useful.

Figure 1.1. Model Predicting Management Tool Use by Public Sector Executives



Source: George, Van de Walle, and Hammerschmid 2018.

As described also in the fifth lifecycle report on evaluation (OECD, 2019), measurement invariably influences human behaviour and has adverse effects (from 'tunnel vision', myopia, misrepresentation and misinterpretation, gaming and ossification, etc. (Smith, 1995; 2005)). Consequently, when developing and using metrics their potential impact on human behaviour has to be evaluated. This is extremely important when future actions are considered and uncertainty connected to processes is high, which is clearly the case with innovation. Also based on the characteristics of people themselves and their positions in organisations their perceptions about innovation differs (De Vries, Tummers and Bekkers, 2018).

If the negative effects of measurement (costs connected to measurement, goal displacement towards proxy measures etc.) outweigh their benefits, then one should

consider alternative ways of getting the feedback or legitimacy needed (from qualitative measures and evaluations, storytelling etc.). Hence, policymakers should also be cautious about measuring too much. One of the most important variables to consider here is that the measures reflect directly the objectives governments want to see in real life either in process or outcomes (goal alignment), as is the maxim – what gets measured gets done. Yet, that also means that metrics in general tend to measure already established behaviours and outcomes, not something that is never been tried out. Thus, measurement in general can stifle the entrepreneurship of civil servants.

2. Measuring public sector innovation

As there are many fundamental challenges connected to public sector innovation metrics (lack of market and uniform value measures, high uncertainty of measuring the 'right things' for the future, long time lags, adverse effects etc.), one can ask – why measure public sector innovation in the first place? Potential uses of measurement of public sector innovation range from broader, general purposes to more specific ones. Among the general uses are: raising awareness, gaining a common understanding of what public sector innovation is, benchmarking both internationally and between organisations and the public sectors, and informing general policy discussions. Metrics can serve as a legitimisation tool for change. On a more specific level, civil servants need also data and signals about when innovation is needed and if they resources available to respond to that need. Thus, there are more specific demands on the data. Examples here are research analyses (such as productivity analyses, innovation cultures, knowledge transfer), and data needs for specific policy initiatives (e.g. innovative procurement, promoting public-private cooperation, specific programmes). At the organisation level, innovation data can also be seen as a management tool. The results of measurement may be used in evaluations, benchmarking, spread of good practices and initiatives – diffusion of innovation –, but also to improve the ability of public sector bodies to foster innovation.

2.1. Prior measurement efforts in the public sector

There have been a number of different public sector measurement efforts (Table 2.2.; 2.3). These have been described in detail in various academic reviews (e.g., Kattel et al. 2013; 2015; Arundel, Bloch and Ferguson, 2018). Without going into excessive detail, by and large the efforts have been survey based. None have used advanced data analytics or Big Data inputs. On the municipal level data platforms presenting more advanced analytics are more common (not directly linked to public sector innovation).

Table 2.1. Key innovation surveys and cognitive testing of innovation in the public sector

Study	Reference	Date of data	Target organisation	Country	Size1	Cognitive testing2
MEPIN	Bugge et al, 2011	2008-2009	Public admin, schools, hospitals	Denmark, Finland, Iceland, Norway, Sweden	2,013	60/328
Innobarometer	EC, 2010	2010	Public admin	All 27 EU countries	3,699	-
NESTA	Hughes et al, 2011	2010	Public admin	England	175	?
APSC	APSC, 2011	2011	Public admin	Australia	10,000	-
APSII	Arundel & Huber, 2013	2012	Public admin	Australia	344	32
Universities	Arundel et al, 2016	2015-2016	Universities	Australia & New Zealand	573	13
Statistics Sweden	Silvander & Hagen, 2015	2014	Hospitals & healthcare providers	Sweden	312	4
OECD	Arundel, 2014	2013	Public admin	Belgium, Italy, Spain	-	30
Innovation Barometer	Center for Offentlig Innovation, 2015	2014	All public sectors (workplace, establishment	Denmark	1,255	7

			level)				
Universities	Arundel et al. 2016	2015-2016	Universities	Australia & New Zealand	531		13
Innovation Barometer	Various	2018	Public sector workplaces on different levels	Denmark, Sweden, Norway, Finland, Iceland		-	?
Personnel Management Diagnosis System	Official communication	2015, 2017	Public managers	Korea		-	

Source: Author based on Arundel, Bloch and Ferguson, 2016, 2018.

Table 2.2. Different approaches to public sector innovation measurement

	EPSIS	UK NESTA	APSC	LSEPPG	MEPIN
Inputs/Enablers	**Human Resources:** Share of "creative occupations"; Share of employees with a university degree; **Quality of public services:** Government effectiveness; Regulatory quality; Increased efficiency of gov services due to ICT; Online availability of public services; e-government development index.	**Innovation capability:** leadership and culture; management of innovation; organizational enablers of innovation; **Wider sector conditions for innovation:** incentives; autonomy; leadership and culture; enablers.	Investment in intangible assets; Innovation expenditures; Human resources devoted to innovation; Staff skills for innovation; Staff attitudes and attributes to innovation; Sources of information; Technological infrastructure for innovation.	**R&D activities** (e.g. dedicated innovation or R&D unit; dedicated strategy unit; expenditure on consumer or market research; expenditure on development and implementation of innovations); **Consultancy and strategic alliances** (e.g. No of joint ventures; consulting expenditures; collaboration programs with universities); **Intangible assets** (e.g. patents; IPR development activities; unit responsible for IPR; trademarks); **ICT infrastructure;** **Human resources** (e.g. staff with grad education; job satisfaction; performance-based promotion system; churn of personnel; etc.)	Information sources: channels of knowledge transfer; interactions between public organizations and other actors (i.e. enterprises, citizens); Driving forces: people, organizations and other factors that push organizations to innovate (e.g. new policy priorities, regulations, citizen feedback, staff, management); The role of ICT; Barriers: political factors, bureaucracy, other internal conditions, such as lack of incentives for staff to innovate; external conditions such as resistance of users to change.
Activities/ Processes	**Capacities:** Share of service innovations in-house; Share of process innovations in-house; **Drivers and barriers:** Internal barriers to innovation; External barriers to innovation; Management involvement in innovation; Importance of external knowledge; Share of employees involved in innovation.	Accessing new ideas; Selecting and developing ideas; implementing ideas; diffusing what works.	Explicit innovation strategy and targets; Systematic, internal measurement and evaluation of innovation; Management practices for innovation; Incentive and reward structures; Practices for learning and diffusing knowledge and innovations; Innovation collaboration and alliances; Perception of enablers and barriers to innovation.	**Institutional performance** (e.g. percentage of targets met; average time to deliver outputs; change program in place; prizes and awards for innovations, etc.) **e-government, online services** (percentage of services that can be requested online; % of services that can be delivered online); **origins of innovation** (e.g. how many: innovations as a result of EU regulations; innovations as a result of ministerial/political suggestions; customer suggestions; management suggestions)	**In-house activities:** in-house R&D; internal or external training and education of staff for innovation activities; other in-house innovation activities (e.g. planning and design; market research; feasibility studies, testing and other preparatory work for implementation of innovations; **External activities:** external R&D; other consultancy services; acquisition of external know-how (patents, licenses, etc.); acquisition of equipment/software. **Procurement practices** – acquisition of services, components or software from ICT suppliers, contracting for management services. **Organizing innovation:** innovation strategy; the role of management; organizing innovation activities; and organizing competences.

Outputs	**Innovators:** Share of organizations in public administration with different types of innovation; Share of new services out of all services innovations; Public sector productivity; **Effects on business performance:** Improvements in public services for business; Impact of innovative public services on business; **Public procurement:** Gov procurement as a driver of business innovation; Procurement of advanced technology products; Importance of innovation in procurement.		On-going innovation projects; Types of innovations; Degree of novelty and scope of innovations (incremental vs radical innovation); Innovation intensity; Related, intangible outputs (patents, trademarks).	Number of innovations developed for delivery of new outputs; number of innovations improving existing outputs; number of innovations altogether; New outcomes.	
Outcomes			Quality and efficiency; Productivity; User satisfaction; Employee satisfaction; Societal and environmental impacts; Other intangible effects (increased trust, legitimacy); Effects of innovations.		
Impacts/Effects/ Other		Improvement in organizational key performance indicators; improvement in service evaluation; improvement in efficiency; improvement context.	**Environmental conditions:** User innovation; Supplier innovation; Wider public sector culture and leadership identified as drivers or barriers; External political and legislative factors identified as drivers or barriers; Leadership and culture; Public tolerance of risk.	Number of innovations joining up across other gov organizations; number of innovations improving performance; Number of people that have been affected by innovations introduced in the government organization for the provision of new or existing outputs.	**Measuring effects or objectives:** efficiency, quality, ICT, organizations and staff, other factors – health and safety.

Source: Kattel et al., 2018.

The main problems with prior measurement efforts have been the following:

- There have been cognitive biases in defining innovation types and novelty of innovation;
- There has been difficulty in measuring actual innovation expenditures; issues with comparability across activities of public sector;
- There has been difficulty in defining outcomes in the short term or attributing them to single innovation and monetizing outcomes in general.

The field is also littered with self-assessment biases (e.g., those who are more innovative are more critical about their activities) and public sector negativity bias (when asked directly from citizens). For example, most studies on organizational change conclude that when it comes to evaluating new organizational practices, managers are more positive than other organizational stakeholders (see, e.g., Jones et al., 2008; de Vries, Tummers and Bekkers, 2018). In addition, those performing well on innovation and know the field better tend to evaluate themselves more harshly than respondents with limited public sector innovation knowledge. Furthermore, many surveys have lumped innovations together in measurement efforts acquiring about multiple innovations at the same time; however, this makes measuring innovation novelty, obstacles, resources etc. accurately almost impossible.

In general efforts have survived one maximally two iterations and then dropped. The approach that is further developed is the Innovation barometer applied in the Nordic countries with the facilitation of the collective Nordic Innovation Hub (Box 2.2.). The measure seems to work best as a communication device that helps to bust public sector innovation myths of lack of innovation.[1]

Box 2.1. InnovationBarometer: measuring public sector innovation in the Nordic countries

The InnovationBarometer was first collected by COI in Denmark in the years 2013-2014 based on the input from the Olso Manual. The Barometer measures the types of public sector innovation, degree of newness and types of values innovation addresses. It was in developed in collaboration with Statistics Denmark and The Danish Centre for Studies in Research and Research PolicyThe results were published as a package of 12 thematic folders, videos, a report, a separate thematic analysis on education and municipalities. COI collected the second data-set regarding public sector innovation in 2015-2016 and published results from this analysis from November 2017 and onwards. Since then the InnovationBarometer has been diffused into other Nordic countries through the common innovation network – Nordic Innovation Hub. The latter operates based on three principles:

- *National nearness*. Activities are closely linked to the missions and tasks of the national actors. The collaboration is not an add-on duty on top of the national tasks and programs, but something that helps fulfil a public sector innovation purpose in a national contexts.
- *Variable geometry*. Within the hub collaboration takes place at different (national

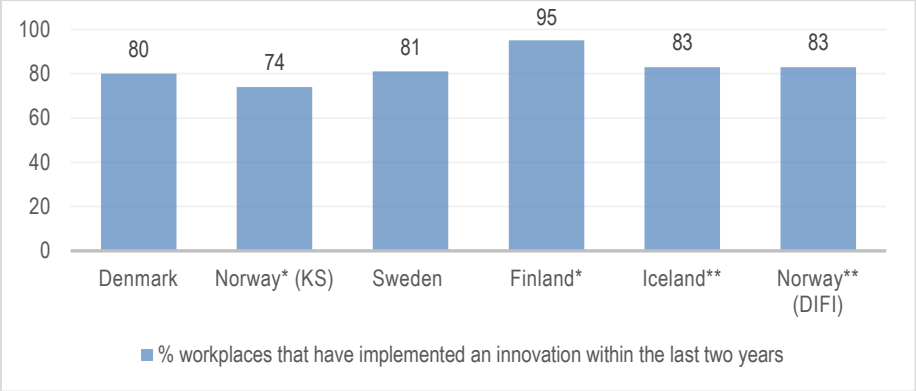
[1] https://apolitical.co/solution_article/eight-myths-about-public-sector-innovation-debunked/

and hierarchical) levels and with different speeds. When there is a shared interest in an activity or subject, the relevant actors join the forces in the relevant form and take action.

- *Informality:* This is an informal and concrete collaboration between Nordic public sector innovation actors on public sector innovation agendas. There is a shifting position of "hub-lead". This "hub-lead" bears the responsibility of convening the hub actors within the principle of variable geometry.

In 2018 Iceland, Finland, Sweden and Norway also carried out their InnovationBarometer exercises with modifications to suit their specific circumstances. This allows to compare levels of innovation on a very high level across the Nordic countries (2.3.), but also raises specific questions about country performance needing additional enquiry (Figure 2.4.).

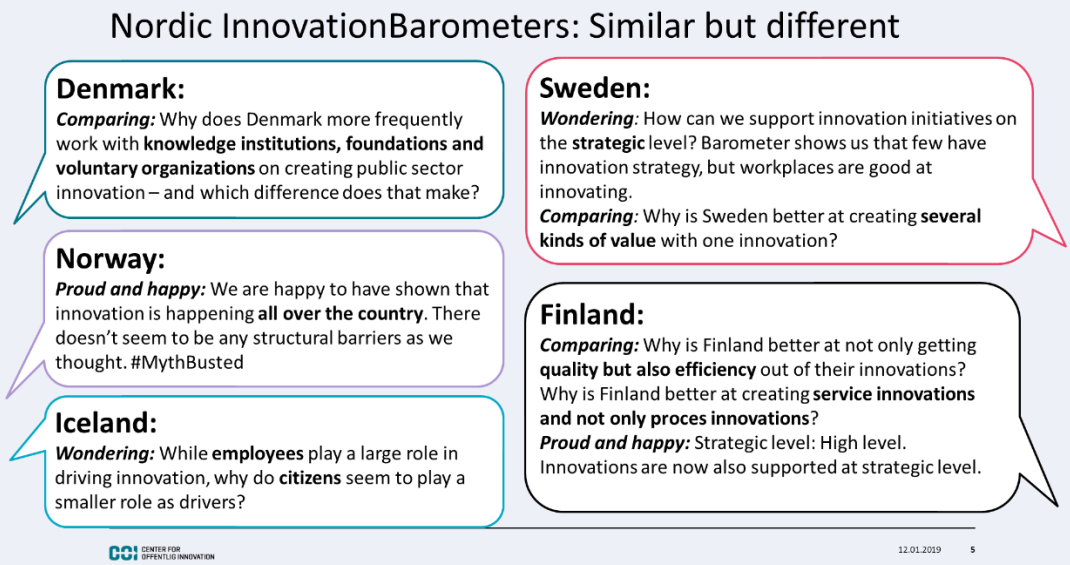
Figure 2.1. Nordic InnovationBarometers



Note: * Workplaces at local and regional level ** Workplaces at state level

Source: : Krogh Jeppesen, 2018

Figure 2.2. Comparisons and questions coming from the Nordic measurement efforts



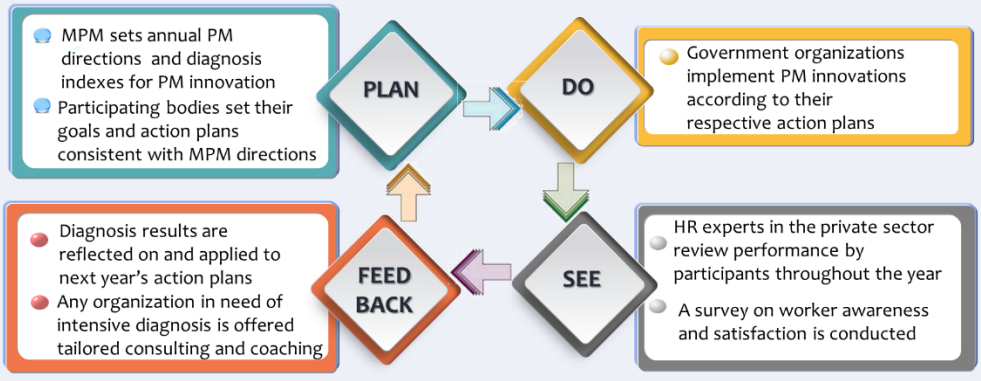
Source: Krogh Jeppesen, 2018 and https://www.coi.dk/en/what-we-do/innovationbarometer/

Another area of rapid development is public sector innovation self-assessment and diagnostics. Here falls also the other ongoing inside the public sector innovation measurement effort in Korea.

Box 2.2. Personnel Management Innovation Diagnosis Indicator in Korea

In 2014 Korea established the Ministry of Personnel Management (MPM) which among other tasks was put in charge of public management innovation. This increased the demand for the effective and responsive personnel management to the public. Starting in 2015, the Personnel Management Innovation Diagnosis Indicators were developed and have carried out objective assessments. Based on the indicators, MPM assesses public management innovations of each government organization and provides feedback to enhance its innovation capability (the overall process is described in Figure 2.3.).

Figure 2.3. The public management (PM) innovation indicator cycle



The measurement consists of 5 fields, 12 items and 41 sub-indicators. The five fields are implementation capacity, balanced PM (open and diverse recruiting), HR development, and expertise/performance management and work environments/conditions for improvement. The diagnostic draws on variety of methods (Table 2.3)

Table 2.3. Methodological approaches

Methods	Characteristics
Quantitative diagnosis method	33 indicators (75%) e.g. open position and non-public servant employment rate, increase in employment of female managers
Qualitative diagnosis method	2 indicators (11%), used when the quantification and objectification of the performance is difficult e.g. excellence in PM innovation plan, appropriateness of education and training plan
Awareness and satisfaction survey method	6 indicators (14%), commissioned to an independent surveying agency e.g. awareness of annual leave, awareness of flexible working, satisfaction in HRD

MPM sets indicators with participating government bodies and external experts after in-depth consideration. Indicators are adjusted on an annual basis, subject to MPM's annual innovation directions, feedback from participating bodies, and changes in environments. The ministry hosts a quarterly workshops to spread good practices and set a benchmark and they offer lagging bodies tailored consulting (from the private sector) upon request

Source: Ministry of Personnel Management (2017) Measurement of Innovation with Personnel Management Innovation Diagnosis Indicators. Presentation at the OECD, OPSI conference.

Outside the national government domain, Meijer (2018) developed a model of the public innovation capacity for the urban context that consists of five functions: mobilizing (M), experimenting (E), institutionalizing (I), balancing (B), and coordinating (C). The idea of measurement here is manifests itself as a way of measuring functions of (eco-)systems supporting innovation (Bleda and Del Rio, 2013).[2] Each function of the system is described by specific activities of capacities the city in questions invests in. Unfortunately, also the current contribution is based on mostly private sector innovation literature, although, some political economy and public debate values are introduced to the assessment framework. What is even more important, often neglected technological capacities are also introduced to the model.

[2] This is based on the "Dutch school" of innovation systems theory that takes a 'functional' approach to innovation (Hekkert et al. 2007; Bergek et al. 2008; Hekkert and Negro 2009; Markard and Truffer 2008; Markard, Stadelmann and Truffer, 2009) and concentrates on a "problem-oriented heuristic" approach (Wieczorek et al. 2015, 130).

Table 2.4. Instrument for measuring the public innovation capacity

Function	Statements for self-assessment
Mobilizing	M1. Employees in City X with ideas about data-driven innovation easily find the right persons in the city to jointly realize these ideas.*
	M2. The people in charge of data-driven innovation in City X succeed in engaging companies, researchers and citizens in the development of new ideas.
	M3. City X has a strong structural network of companies, researchers and citizens connected to data-driven innovation.
	M4. The people in charge of data-driven innovation in City X succeed in stimulating the development of new ideas among colleagues in City X.
	M5. City X has a strong network of employees with an interest in data-driven innovation.
	M6. A company, researcher or citizen with good ideas for data-driven innovation easily finds the right persons within City X to develop these ideas further.
Experimenting	I1. City X is successful in setting up experiments.
	I2. City X has societal support (from citizens, NGOs, companies, etc.) for experiments on data-driven innovation.**
	I3. Political institutions in City X representatives, aldermen support experiments with data-driven innovation.
	I4. The administrative executives of City X support experiments with data-driven innovation.
	I5. City X makes sufficient funds available for experimenting.
	I6. If necessary, City X engages other governments, companies and societal organizations in experiments around data-driven innovation.
Institutionalizing	R1. City X is successful in scaling up experiments.
	R2. City X adopts data-driven innovation that have proven to be successful on a small scale in the organizational routines.
	R3. City X evaluates experiments with data-driven innovation well.
	R4. City X succeeds in turning experimental collaboration with governments, companies and societal organizations into structural forms of collaboration.
Balancing	B1. City X succeeds in identifying risks, disadvantages and tensions around data-driven innovation.
	B2. City X initiates the public debate about the risks, disadvantages and tensions around data-driven innovation and how to deal with these.
	B3. If there are conflicts, City X is good at mediating conflicts around data-driven innovation.
	B4. In City X, ethical aspects of data-driven innovation are discussed well.
Coordinating	C1. City X makes financial means available for data-driven innovation on a structural basis.
	C2. There is a good exchange of information on data-driven innovation between all actors in City X.
	C3. City X has a culture that stimulates data-driven innovation.
	C4. City X creates the right conditions for data-driven innovation (training, information exchange, instruments, etc.).
	C5. City X has a clear vision on data-driven innovation.
	C6. Political institutions in City X representatives, aldermen are prepared to allocate financial means in the budget for data-driven innovation.

Source: Meijer, 2018.

2.2. The influence of the Oslo Manual

For private sector guidelines for how to use surveys to measure innovative activities have been available via the OECD's Frascati Manual for R&D since the early 1960s and via the Oslo Manual for other innovation activities since 1992 (see figure 2.4.). In a recent decades experts have been exploring if the Oslo Manual's can be applied in the public sector as well leading influencing several measurement efforts outline in Table 2.2 (incl. APSC, 2011; Arundel and Huber, 2013; Bloch and Bugge, 2013).

Figure 2.4. Measurement perspectives for innovation

	Innovation actors = subjects of analysis			
Sources of data	Business	Government	Private non-profit organisations	Individuals/ households
Business (Senior executive, manager, designated contact)	Oslo Manual (managers on business and its environment)			
Government (Managers, etc...)		Adaptations of Oslo to government sector - e.g. MEPIN...		
Private non profit (managers)			Some adaptations in a social innovation[1] context	
Individuals/ Households				Consumer innovation surveys
	↑	↑	↑	↑
	Individuals engaging in/working for organisations / units in different sectors			

1. Social innovation has been defined as innovations that are not only social in their means (e.g. their actors) but also in their ends. (See for example http://www.nesta.org.uk/sites/default/files/the_open_book_of_social_innovation.pdf)

Source: Galindo-Rueda, F. (2017) OPSI Conference Closed Session on Measuring Public Sector Innovation, November 2017.

The Oslo Manual defines an innovation as something that is new or significantly improved (to the firm), The innovation also has to be implemented. The new or significantly improved is a difficult measure for the public sector, because 'improvement' is very difficult to monetise in the public sector. In addition, implementation is sometimes fuzzy, as most public sector innovations are concerned with services or processes (Arundel et al, 2016). On the whole, it seems to derive the definition of public sector innovation and its measurement from the differences with private sector innovation (Box 2.2.), rather than providing a theory of change that is unique to the public sector.

Box 2.3. Oslo Manual (2018) account of innovation in the general government sector

The general definition of an innovation for all types of units outline in the Oslo Manual is as follows:

> "*An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process).*"

The Oslo Manual sees the key difference between public and private sector innovation as the lack of economically significant prices for their goods or services. Many process innovations in the Government sector draw on or are similar to innovations in the Business enterprise sector, but public service innovations often pursue redistributive or consumption-related goals that are unique to government. The absence of a market alters

both the incentives for innovation and the methods for measuring innovation outcomes compared to the business sector. Without data on the cost or price paid for government services, outcome measurement has relied on subjective, self-reported measures, such as an increase in efficiency or improved user satisfaction (Bloch and Bugge, 2013). It is also difficult to provide aggregated economic outcome measures (financial measures of cost savings or benefits) or external validity measures for outcomes. High-quality outcome measures are generally only available for specific innovations.

Source: OECD/Eurostat 2018.

Nevertheless, the assumption was that many elements from Oslo Manual could be transposed to the public sector (table 2.5.). However, some not appropriate or are simply less relevant in public sector or impossibly to measure (e.g., implementation, novelty, impacts). Focus on surveys of organisations, but need for complementary approaches including surveys of users/citizens, employer/employees, qualitative approaches (examples, awards, case studies), other existing data sources (budgetary data, public sector outputs, e-government, etc.)

Table 2.5. Relevance of Oslo Manual's topics to public sector innovation

Oslo Manual topic	Public sector comparability	Comments
Innovation definitions	Moderate	Workable general definition of innovation available for both the business and public sectors, but the public sector includes innovation types (conceptual and policy innovations) that are difficult to fit within the Oslo Manual typology for innovation.
Innovation activities	Moderate	Some of the activities covered in the Oslo Manual (R&D, acquisition of external knowledge such as intellectual property, engineering) are less commonly used in the public sector, while other activities (training and purchases of equipment) are frequently undertaken in the public sector.
Innovation expenditures	Low	Difficult to obtain expenditure data for innovation in the public sector because internal investments focus on staff, with measurement in terms of personnel numbers or person-months for innovation.
Knowledge sources	High	Good comparability, but public sector surveys need more details on government sources.
Collaboration	High	Good comparability, but public sector surveys need more details on government sources.
Drivers	Moderate	Common drivers for the business sector (profit and competitiveness) are less relevant for the public sector, but both share consumer demand as a driver of service innovations.
Objectives / Outcomes	Moderate	The public sector lacks a sales measure for services, but shares qualitative outcomes such as quality, lower costs, speed of delivery, etc.
Obstacles	Low	Similar interests in insufficient resources, but the public sector potentially faces many internal obstacles that are not discussed in the Oslo Manual, such as staff resistance, a negative innovation culture and risk aversion.

Source: Arundel, Bloch, and Ferguson, 2018.

2.3. Learnings from past experience

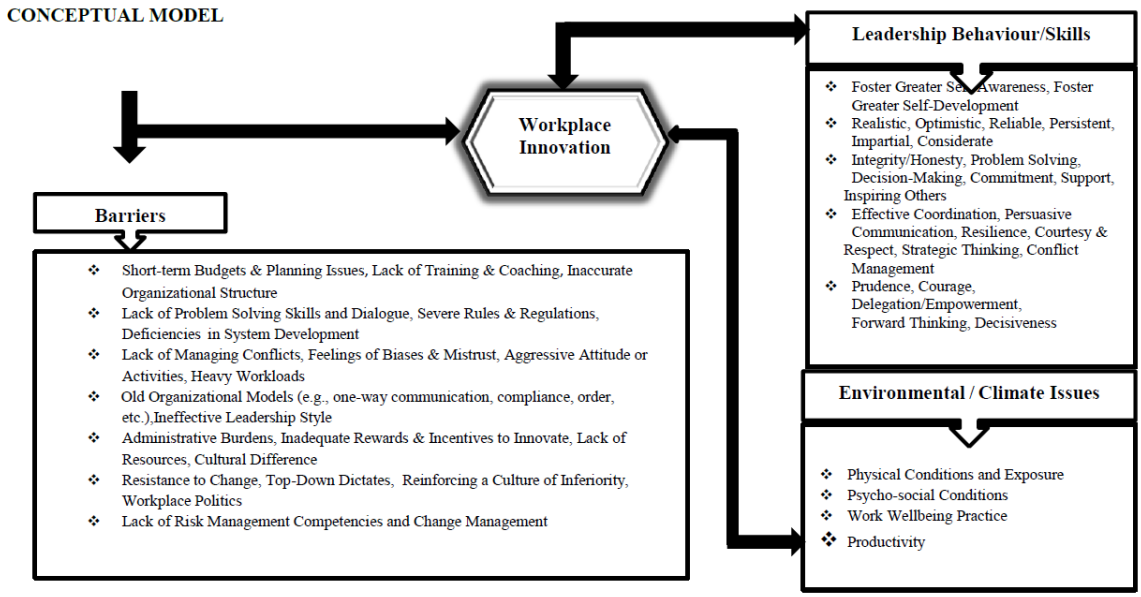
The previous subchapters tried to give a succinct overview of prior and ongoing measurement – and the influence of the Olso Manual – in the field of public sector innovation. What can be learnt from these efforts? As described above, there is a strong

influence of private sector innovation measures both on the level of theoretical approaches and the empirical trails of public sector innovation measurement. Among these, management and economic disciplines have been the most influential in measuring public sector innovation (Arundel, Bloch and Ferguson, 2016; 2018). There reason for it may deliberate, but caused by the fact that these are simply the background of people working on measurement issues in the public sector.

Hence, it is not surprising that the emphasis has been on drivers and barriers of innovation, organisational structures, inputs and outputs with almost no analysis of broader impact and outcomes in the public sector (see also Table 2.2.). Conversely, efficiency and effectiveness goals – important in management literature – have not played a role at all in the measurement efforts; while research has shown that costs have been one of the most frequently cited causes to innovate in the public sector (De Vries, Bekkers and Tummers, 2015). Pressure to innovate can of course come from a variety of reasons, ranging from public demand for new or improved services to budgetary constraints (Walker, 2006; Hartley et al, 2013).

Current public sector innovation indicators seem to also capture more incremental rather than transformative change (Kattel et al. 2013). This is due to the 'service' nature of public sector activity, but also due to the fact that transformative change is not analysed in longer time horizons or side-effects of innovation taken into account; and thus, innovation 'through' the public sector is ignored. Furthermore, economics or private sector based rationales do not provide good measures for radical change in the public sector anyway: public sector innovation rarely results in patent applications or or traditional signs of radical innovations (Bloch and Bugge 2013; Bugge and Bloch 2016). Moreover, productivity – as the main indicator in the private sector – has not played a role in any of the measures (Kattel et al., 2018). Side effects in and outside of the public sector are rarely if ever captured.

Figure 2.5. A conceptual framework of the factors influencing innovation in public sector organizations



Source: Moussa, McMurray and Muenjohn, 2018.

There is sufficient data and studies to identify a variety of variables influencing public sector innovation, but 'what works' and what hinders innovation in terms of a causal logic model or theory of change is rare (e.g., figure 2.3). Nevertheless, there is a laundry list of influents to choose from (see also Annex A of the results of the OECD public sector innovation exert group suggestions). For example, innovation success can be affected by:

- *Individual characteristics* such as motivations of managers (Halvorsen et al, 2005), tenure on a particular post (Meynhart and Diefenback, 2012), an 'entrepreneurial mindset' (Damanpour and Schneider, 2006), attitudes towards risk (Chen and Bozeman, 2012; Hartog et al, 2002; Roszkowski and Grable, 2009) and prior experience with innovation (Boyne et al, 2005). In addition, descriptive variables such as gender, the length of time in current position, and job level in the public sector hierarchy (this may be known in advance and used for sampling), number of employees that report to the respondent and the function of the manager's department can influence innovation success. Furthermore, when it comes to innovation self-selection often plays a huge role.
- *External and internal drivers* for example organisational culture (Borins, 2001; Brown, 2010; Kay and Goldspink, 2012; Osborne and Brown, 2011; Potts and Kastelle, 2010), budget restrictions (Torugsa and Arundel, 2015) and political leadership (or its uncertainty), restructuring, policy directives or changes in laws or regulations, a crisis requiring an urgent response, and budgetary drivers, including both a change in the budget and the 'need to do more with the same budget'. Also, external factors such as media scrutiny and prior experience with innovations can play a significant role (Potts and Kastelle, 2010), in addition to technological risks (Torugsa and Arundel, 2015), negative user responses (Kay

and Goldspink, 2012) that can all add to reputational risks of civil servants (Parna and Tunzelmann, 2007). Furthermore, the interaction between individual and organisational factors can influence the successfulness of innovation (e.g., the misalignment of individual incentives and organisational support (Osborne and Brown, 2011)).

- *Inputs*, for example person months spent on innovation, the availability of sufficient resources (funding, time, or personnel) for developing innovations or if the manager received extra funds specifically for innovation activities. Questions on external resources can inquire into purchases of R&D services, consultants, IT purchases, etc.. Questions for financial estimates or costs of external purchases have not been tested and in many cases respondents may not know the answer if the finances are handled by another department.
- *Processes and strategies*, for example, the existence of formal strategies and vision or the use of design thinking, co-creation and user-led innovations. Stakeholder engagement and collaborative innovation are getting increasing attention in the public sector (Godenhjelm and Johanson, 2018). Innovation can also be measured by location of innovative activity within the hierarchy: either it is dependent on top-down decisions by senior managers or it can occur as a bottom-up process in which all staff can be actively engaged. Also other organisation/leadership culture elements can be applied, e.g., transformational leadership and autonomy, the level of support by senior management for innovation, the provision of incentives, and the attitudes of both management and other staff towards risk and change.
- *Outcomes* which is fairly an untested field as there is no equivalent to share of sales due to innovation (that e.g., the Oslo Manual suggests for the private sector). Thus, benefits are usually measured by subjective metrics based on respondents perceptions of improvements of services, satisfaction rates, improved user access to information, better working conditions for employees, simplified administrative procedures, faster delivery of services, and a reduction on the costs of providing services etc. This does not mean that innovation does not influence public sector productivity for example, it is just difficult to measure (more discussion on this in the next subsection).
- *Innovation novelty and level of transformative change*. Evidence base on public sector innovation has shown a great variety in the complexity and scale of innovations (Bugge and Bloch, 2016). For example, in the MEPIN study novelty of innovation was coded based on written descriptions of innovation of most important innovations the previous year (*Ibid*.).
- All of the above can also be looked at as *obstacles to innovation* if insufficient resources and undesirable characteristics prevail and feed into resistance to change.

The role of indicators as control mechanisms that deliver legitimacy and trust have in underutilised in designing indicators; yet, in practise (with the spread of the InnovationBarometer from Denmark to other Nordic countries) they have been used for that purpose. Thus, the design of public sector indicators – at least in theory – has not taken it into account in its main functional use so far.

Previous experience also gives insights into the specifics issues of survey-based innovation measurement connected to measurement bias and usefulness of the data generated. For example, surveying a public sector manager of a single state is unlikely to be very useful for domestic research – it lacks sufficient detail –, although it can be applied in some cases when higher level comparisons between multiple states or countries are of interest. Also issues connected to asking about innovation 'in general' or the "most important innovation," 'most successful', or 'most recent' innovation become clear (see table 2.6.). There are many advantages in including single innovations into measurement efforts: it allows respondents to zero in on specific change processes and does not confound change within an organisation improving the accuracy and interpretability of the data. Yet, innovations can be also a result of coincidental activity meaning that one might lose out on reflections on the organisation's overall innovation activity. Measuring specific types of innovations, as what works for developing a new service could differ from what works for improving an internal process. Again, the purpose of the measure should be the guiding decision point which approach to use. Arundel, Bloch and Ferguson (2016) recommend a hybrid approach that combines the object-based method with questions on a single innovation with the subject-based method with general questions on innovation strategies and capabilities.

Table 2.6. Suitability of questions for multiple and single innovations

Question / topic area	Single	Multiple	Comments
Types of innovation(s)	**	**	Can be asked for both & useful for both
Collaboration	**	**	Can be asked for both & useful for both
Staff redeployment / hiring	**	**	Respondents can remember both all hiring/redeployment & those limited to one innovation
Workplace/organisational culture	**	**	Relevant to all innovations
Innovation support strategies	**	**	Relevant to all innovations
Obstacles for all innovations	**	**	Relevant to all innovations
Information sources	*	**	Can be asked of both, but most useful for all innovations
Drivers / reasons for innovating	*	**	Can be asked of both, but most useful for all innovations
Innovation novelty	**	*	For multiple innovations, can ask if any of the innovations were a country first.
Outcomes	**	*	Accuracy better for a single innovation
Obstacles for an abandoned innovation	**		Accuracy much better for a single abandoned, failed or under-performing innovation because these are rare
Resources in head counts	**		Accuracy better for a single innovation
Resources in person-months	**		Accuracy better for a single innovation
Source of the initial idea	**		Accuracy better for a single innovation

Note: Only one star: possible, but not as accurate or useful. Two stars: Significant improvement in accuracy and/or usefulness
Source: Arundel, Bloch and Ferguson, 2016.

2.4. The ever-elusive case of public sector innovation impacts and productivity

It is widely acknowledged that innovation and technological change are major drivers of productivity growth. In the private sector, most firm-level measurement concentrates on the effect innovation has on productivity (mostly labour productivity, not total factor productivity, due to limited data on capital and other inputs (Mairesse and Mohnen 2010)). However, the impact of innovation on employment is not simple – no clear-cut diagnosis exists either theoretically or empirically (Vivarelli 2007, 729): innovation and technology can both create and destroy jobs; consequently, the question is more what

type of jobs are created/destroyed and how does it affect the skill- and wage-structure of organisations. When it comes to 'innovation outputs' innovative sales, patents, R&D investments are analysed in connection to productivity. Consequently, the literature still does not provide a clear answer on the magnitude of impact of innovation on productivity (e.g., Mohnen and Hall 2013) – this mostly due to the uncertainty and variability intrinsic to innovation and time-lags of effects.[3] Nevertheless, OECD (2015, 4) has evaluated productivity growth due to innovation related activities in the private sector to up to 50% of total GDP growth.

Furthermore, the impact of innovation on service productivity is especially difficult to measure: services are intangible, characterized by simultaneous consumption and production and are less R&D-dependent, which means that many measurements based on R&D investments, patents etc. developed for manufacturing cannot be used to tie innovation to productivity (see Kattel et al. 2013). Thus, various proxies are used to measure the actual impact of innovation on service productivity. As such, innovation is the critical intangible to productivity, but it is very difficult to measure its exact impact on the latter.

In the public sector these issues become compounded. Mostly characterised by services and lacking market-driven, monetized measures of outputs, not only public sector productivity, but also innovation, is difficult to measure. Not to mention the causal effects between the two. Specifically, the widely debated Baumol's disease describes one negative outcome of lack of 'publicness' of productivity (i.e., technological progressive activities lie outside of the sector):[4] as productivity increasing activities (e.g., ICT application today) raise general living standards and incomes, this tide reaches also activities without such productivity increases, thus, raising wages also in sectors without technologically progressive activities (Baumol 1967). While different sectors may use the benefits of ICT today, the value added that is created is concentrated within the technology sector. This means that costs due to overall wage pressures balloon without productivity growth to back it up. Often the activities inflicted by Baumol's disease are in the public sector (e.g., education, health) – these services tend to suffer from irreversible cost increases over time. So, for example, there may be substantial technological advances in the healthcare sector, most of the value-added is created in the medical technology industry and not within the public sector itself. While the innovation that originates in health services can be also how that technology is integrated in the health care processes, for ongoing productivity growth the question is where the increasing returns to scale (e.g., technology sales) concentrate.

Consequently, it could be argued that the problem of productivity growth from an innovation perspective does not come primarily from mismanagement, lack of capabilities or corruption in the public sector (while these all can have an effect), but is

[3] Innovation can be very disruptive, so in short-term it may actually reduce productivity because of increase costs (e.g. dual running and cost of setting up new process alongside existing, impact on staff capability of working with new system and time to get used to new approach).

[4] If wages are driven at the margin by productivity growth in market-driven industries then due to spillover affects public sector wages will also rise even if there are not underpinned by productivity increases in the public sector (Boumol and Bowen 1966). To make the point clear, William Baumol distinguishes between technologically progressive and non-progressive activities (Baumol 1967). Technologically progressive activities are those in which innovations, capital accumulation and economies of scale lead to cumulative productivity rise. Technologically non-progressive activities are those, which, due to their inherent characteristics, lead only sporadic increases in productivity.

limited due to lack of possibilities to use technological innovations directly as products in public service provision. This productivity trap produces different responses within the public sector from reallocating funding from one area to another, tax increases, restricted access to services (wave of personalization of services, user fees, privatization) and relying more heavily on citizens, i.e. collaborative innovation (using clients' own input, volunteers and civic organizations through co-creation and contracting to off-set cost increase).

Many of the measures and connected innovations in the public sector can only lead to 'one time productivity increases' and do not guarantee ongoing productivity growth. The adoption of common procurement, changing employment terms, shifting users to online channels, and the use of shared services, can be seen as delivering a "transactional" improvement to public sector productivity by improving one-time efficiency. "Transformational" improvements in productivity can be delivered by re-thinking, re-scoping, re-designing services or systems of the public sector. The question is if innovation within the public sector itself will create productivity increases in the form of economies of scale – through transformational improvements – that will counteract the Baumol's disease. So, unless public sector can achieve large and genuine productivity gains through innovation within the sector (e.g., through automatization), there is a risk that due to pressure for wage increases from the outside the quality of services may decline, if funding is not increased. This requires also new types of technology capacities within the public sector that can manage the lifecycles of these innovations, so, that increasing return from innovations remain in the sector.

Consequently, the true measure of success in productivity measurement in the public sector is in the fact if the technological progressive innovations and the associated scale effects within public sector organizations can be captured. Both due to measurement issues and lack of exploring the afore-described effects, there is very little clear evidence linking innovation to productivity measures in the public sector. For example, technology based studies have not shown a clear link between ICT adoption in the public sector and productivity increase (e.g., Garicano and Heaton 2010; Misuraca et al. 2013; Savoldelli et al. 2014), because it is very arduous to account for the output and input changes for the traditional organizational productivity calculus. Moreover, most studies do not consider the link between ICT use and innovation (and their overlap) not to mention larger networking effects, although there is some limited evidence that it affects productivity in public sector organizations (Dunleavy and Carerra 2013; Dunleavy 2015). This means that there are boundary crossing activities) and effects (for example, when productivity increases happen through the collaboration of organization, sectors and citizens that current measurement systems do not account for. As such, innovation projects in general can have multiple actors, at both the same and different levels of the public sector; and thus, it can be difficult to isolate the specific impact and effect of particular project and/or particular organisation within a project.

Private sector research shows that drivers of innovation are different across organizations: they can be cost-driven, demand-driven, user-driven and employee-driven (OECD 2010). This means that productivity change due to innovation can indicate very different changes within public sector organizations. For example, by improving HR management and budgetary flexibility the inputs to services can become more efficient and effective; however, innovation can also affect the output/service measure itself by radical redesign, co-production etc. Furthermore, innovation can occur both on the input and output side of the productivity equation. Innovation can, thus, create 'radical efficiencies' meaning that services themselves change and with them the associated costs. Not only do the inputs

change, but also their content – tasks, roles change considerably. Innovations can also increase the consumption of resources – input variables – especially in long term maintenance of enhanced IT systems, that on paper, increase government inputs. In both cases, these changes can considerable influence input-output measurement as volume changes in labour inputs/cost accounting usually do not capture these effects. Some academics try to surpass these issues by concentrating and measuring the impact of technology on public organizations performance in terms of changes in technological capacities (e.g., Lember et al. 2016).

Many of the case studies collected in Observatory of Public Sector Innovation cite efficiency gains as one of the main objectives of innovation. The same has been shown in recent academic reviews of public sector innovation (De Vries et al. 2015). However, this does not mean that larger outputs and better outcomes have been reached.

As the quality dimension of public services can considerably change through innovation in addition to productivity a wider view of productivity measurement effort is needed, thus, not measuring evaluating only efficiency, but concentrating on the concept of effectiveness. This remains challenging: effectiveness – in theory – is seen as value creation to citizens and there is no maxim of the former and is, thus, very hard to quantify (Tangen 2005). Nevertheless, aAgreater focus on productivity in the public sector, and better measurement of it, allows public managers and policy makers to identify differential performance. In some cases this may result in tried-and-tested approaches of performance-improvement, such as aligning approaches with best practice. In other cases poor productivity may act as an indicator of the need to innovate and explore new and different ways of approaching the policy challenge. Further, not all innovation projects lead to productivity improvements, or have that as a key objective. The often disruptive and complex changes associated with innovative projects in the public sector can make it difficult to assess the impact of innovation on public sector productivity. However, as with other approaches to performance improvement, it is important to encourage the diffusion and adoption of practices from innovative projects that improve productivity.

3. Public sector innovation measurement - quo vadis?

3.1. Pushing public sector innovation measurement forward

Previous chapters have outlined the utility and also the risk of public sector innovation measurement (which in more detail was already covered in lifecycle study 5 on evaluation) with the pitfalls, deficiencies and learnings from the prior measurement efforts. To sum up, by now there is a relatively good outline of factors influencing public sector innovation; yet, they have not been classified or studied in the context of different types of innovations. The latter is due to on the one hand, difficulties in classifying the nature of transformative change in the public sector context; and on the other, the utter lack of innovation impact measures outside self-reported change. Hence, despite an increasing number of studies on innovation, the works have generally treated innovative activity as a homogeneous phenomenon.

Nevertheless, past research has argued that distinguishing different types or dimensions of innovation is necessary for understanding organizations' innovative behaviour, because they have different characteristics and organisational responses (De Vries, Bekkers and Tummers, 2016; Torgase and Arundel, 2016). For example, there is a sub-stream of 'complex innovations' (Damanpour, Walker, and Avellaneda, 2009; Goffin and Mitchell, 2010; Demircioglu and Audretsch, 2018). Others have applied the radical/transformative or incremental innovation dichotomy (Albury, 2005; Osborne and Brown, 2013). This is important, because if we know how (public sector) innovation fundamentally functions then the need for indicators and measurement becomes clearer and it is also easier to look at causal linkages and size of effects.

The core element of any measurement framework is, thus, the ability to define key concepts and conceptual frames, such as what constitutes innovation and the different types of innovation. For example, measurement efforts do not include specific public sector 'products' and processes – e.g., policy innovations or service delivery – then respondents will find the closest match, thus, confounding concepts and introducing bias into the analysis (Arundel, Bloch and Ferguson, 2018). Previous definitions of innovation in general follow a functional logic by connecting innovation to services, service delivery, administrative or organisational improvement, conceptual change, policy or systemic innovation (Windrum, 2008). This, however, in terms of scale of effects or even the theory of change (think about Schumpeter's Mark I and II entrepreneurs) might be too general to be useful to organisations structuring public sector innovation activities. Thus, a leap forward in the in the public sector innovation theory itself is needed.

3.2. In search of a new theory of change

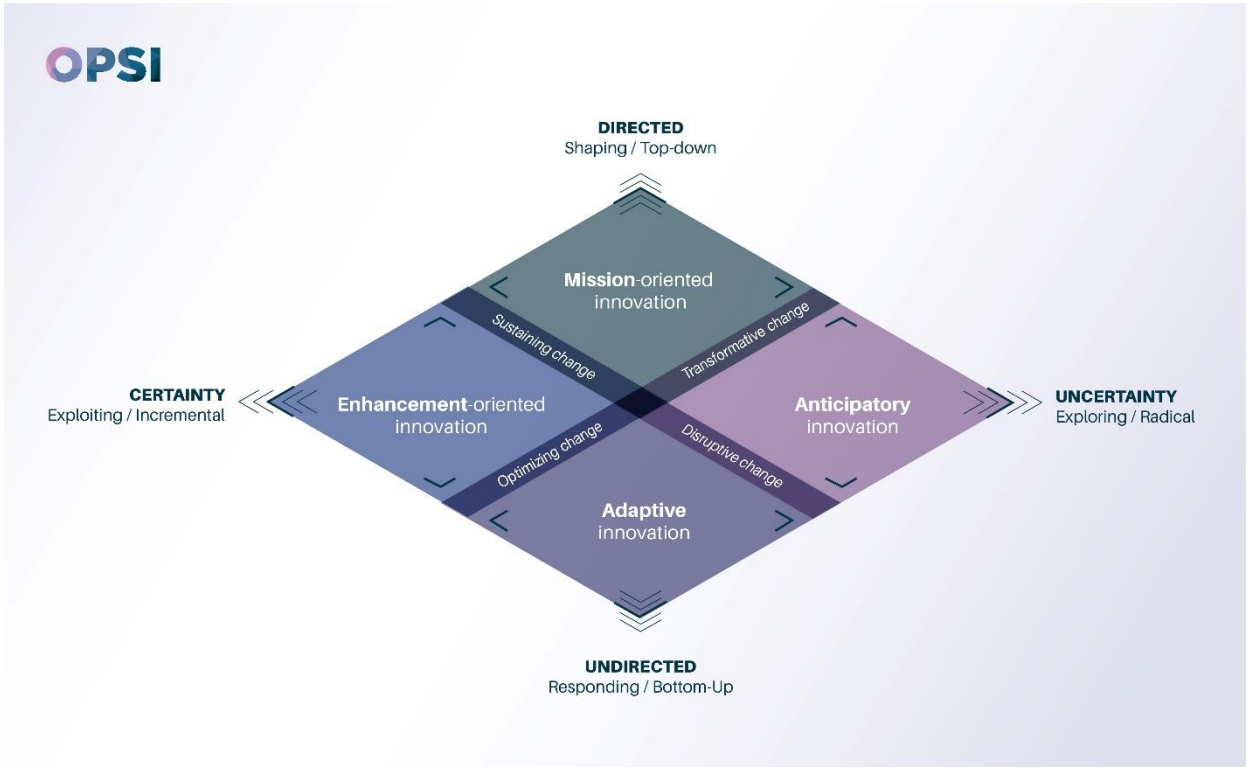
Assuming that differentiating innovations brings value to their stewardship and their measurement, the Observatory of Public Sector Innovation at the OECD has proposed a public sector innovation facet model based on two core characteristics – directionality and uncertainty. The current report hypothesises that also measurement efforts for these

different facets will differ. As such, public sector innovation will occur in contexts with different levels of uncertainty, and those different contexts will require different strategies, working methods, and types of dissemination and diffusion. An innovation portfolio can be understood in terms of facets, depending on two factors:

- Is the innovation directed? Does it have a clear intent/objective that it is trying to achieve in terms of outcome, or is more about discovery and responding (proactively or reactively) to externally generated change?
- Is the innovation dealing with high uncertainty? For example, is the context one of exploring completely new ground, or is it one where the challenge and context is relatively understood and more efficiency goals are searched for?

Based on these two factors, four facets emerge (Figure 3.2). The specific features of each facet and their potential measurement needs are succinctly outlined below.

Figure 3.1. Public sector innovation model



Note: The model is developed as part of the work of the Observatory of Public Sector Innovation, OECD.
Source: OECD.

3.2.1. Enhancement-oriented innovation

This facet focuses on upgrading practices, achieving efficiencies and better results, and building on existing structures, rather than challenging the status quo.

It will generally exploit existing knowledge and seeks to exploit previous innovations. This type of innovation often builds efficiency, effectiveness and impact via existing processes and programmes.

This is traditionally where most governments have focused their innovation efforts.

Innovation measurement here will be concentrated on efficiency and effectiveness and more traditional measurement approaches can be applied.

3.2.2. Mission-oriented innovation

This facet involves a clear outcome or overarching objective for which innovation is leveraged. There is a clear direction, even if the specifics of how it will be achieved may be uncertain.

This type of innovation can range from the incremental to the more radical, but will often fit within, rather than subverting, existing paradigms.

Such innovation can be very important for achieving societal goals, though it also works at an organisational or individual level to align activities. Public sector bureaucracies are naturally attuned to this sort of innovation, provided there is sufficient political will.

Missions can generate motivation and inspiration, a sense of what is trying to be achieved beyond the day-to-day process work, as well as guidance and reassurance when specific plans fall off track.

Measurement of mission-oriented innovation has to take a cross-boundary and systemic perspective, measuring dynamic capabilities to be useful for innovators, but also provide clear lead indicators if a mission is reached or not as communication devices for broader buy-in.

3.2.3. Adaptive innovation

In this facet, the purpose to innovate may be the discovery process itself, driven by new knowledge or the changing external environment. When the environment changes, perhaps because of the introduction of innovation by others (e.g. a new technology, business model, or new practices), it can be necessary to respond in kind with innovation that helps adapt to the change or put forward something just because it has become possible.

This type of innovation can also range from the incremental to the more radical. However the more radical adaptive innovation is, the more likely that a public sector organisation will either endorse it from a leadership level or seek to suppress it or force it outside of the organisation.

Adaptive innovation can be extremely valuable in matching external change to internal practices and usually it cannot be directed top down, because people's developing needs cannot be prescribed. Adaptive innovation will generally be driven from the bottom-up, as those closest to citizens and services will often be the ones who see the need for change and react accordingly.

Measurement that are helpful to adaptive innovation are mostly connected to the enabling environment and leadership roles within the organisation that allow for slack, autonomy, experimentation and also the potential to include external stakeholders and lead by user-driven practises.

3.2.4. Anticipatory innovation

This facet involves exploration and engagement with emergent issues that might shape future priorities and future commitments. It has the potential to subvert existing paradigms. Very new ideas generally do not cohabit well with existing reporting

structures, processes, and workflows. Anticipatory innovation therefore generally requires being sheltered from core business and having its own reporting structures, autonomy. Otherwise, the pressures of very tangible existing priorities (such as existing missions) are likely to cannibalise any resources that are dedicated to something preliminary, uncertain, and with no guarantee of success.

Anticipatory innovation is important because big changes are often easiest (and cheapest) to engage with and shape when they are still emergent and not locked-in.

This type of innovative activity is the most uncertain and future oriented (option theory) thus measurements combined with outlooks and options analysis, autonomy of innovators are needed. Also, external sources are a crucial source for generating innovations (Demircioglu 2017b; Demircioglu et al. 2017; Walsh et al. 2016) and nowadays, also technological capacities (Lember, Kattel and Tõnurist, 2018). This may also mean that feedback from the current system has to be to a degree ignored.

3.3. Where next?

> *"The intelligence analysts who ultimately located Osama bin Laden worked on the problem for years. If measured at any point, the productivity of those analysts would have been zero. Month after month, their failure rate was 100 per cent, until they achieved success. From the perspective of the superiors, allowing the analysts to work on the project for years involved a high degree of risk: the investment in time might not pan out. Yet really great achievements often depend on such risks*." Jerry Z. Muller on Metrics Fixation[5]

Primarily, better measures will rely on better conceptual frameworks of public sector innovation. Thus, there is an urgent need to move away from private sector and economics-led cost-benefit assumptions of innovation measurement. Furthermore, as argued above, the measurement needs to become more nuanced to the types and roles of innovation itself. Based on the former more or less certain measures of success can be outlined. Furthermore, the purpose of measurement from innovation to innovation facet should be more thoroughly examined and empirically tested. Based on technological maturity or innovation maturity in general, different input, output and outcome measures can be looked at. In early stage developments input measures are the most meaningful (e.g., commitment to experimentation or the existence of dynamic capabilities within the organisations), while in the later stages of an innovation project more process based indicators (failure, ideas prototyped etc.) can be applied. Outcomes of innovations in many cases can be only measured in the distant future.

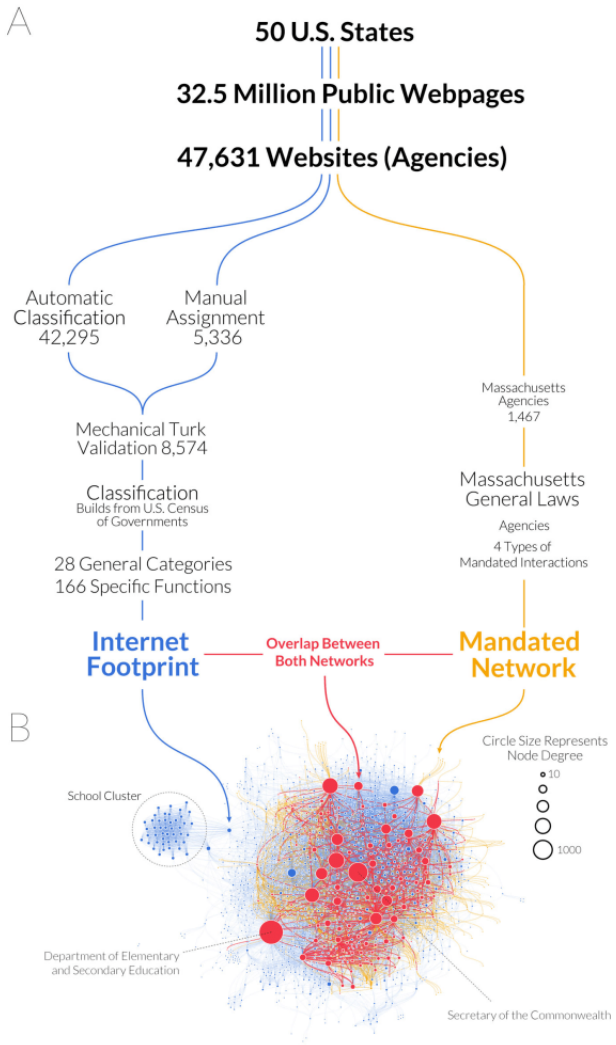
Invariably, the scope of data sources in public sector innovation measurement should expand survey based measures. The latter are very unhelpful when it becomes for anticipatory innovations for example, because the unknowns are too great. The focus on the direction of innovation has also brought attention to the governance of innovation, particularly on the need to reflect on – and not merely measure – innovation systems

[5] http://blogs.lse.ac.uk/impactofsocialsciences/2018/05/24/against-metrics-how-measuring-performance-by-numbers-backfires/

(Lindner et al., 2016). Thus, measuring the wider aspects of innovations systems rather than individual or organisational performance.

As there are considerable challenges with survey-based methodologies for measuring the effects of public sector innovation, the discussion around big data and social media based indicators (big data, digital footprints, data scoring, social media scraping etc.) has also emerged. This includes sentiment analysis based on Twitter to understand citizens' satisfaction etc. More direct feedback systems (big data and social media) as part of a compendium of measurement inputs will feed into decision-making about public sector innovation. Furthermore, esp. in the field of public safety real-time measurement efforts have been on the way – the link to public sector innovation has to be still drawn. What is most interesting here is the potential to spot new, unobserved interdependencies in the innovative process itself and build public sector innovation theory. Figure 3.3. shows a very good example how new ways of analysing and structuring data can lead to new understandings of how the public sector works.

Figure 3.2. The Internet Footprint of US State Governments



Source: Kosack et al. 2018.

What is important to note, is that public sector innovation measurement is invariably a moving target (Bloch and Bugge, 2013). Even if it is possible to develop a perfect conceptual framework for innovation (which it probably is not) it is a dynamic process which is continuously changing. Thus, any public sector innovation measurement framework needs moving targets and continuous critical renewal – what worked in the past for innovation, does not have to work for it in the future not to mention the innovations themselves.

4. Remaining issues

This is an alpha version of a study – i.e. it has been developed to seek input and test various ideas and features. In that light, feedback is sought about the report and where it may need to be improved, where there may be assumptions or arguments that should be challenged, and whether the report provides a sufficient basis for providing guidance to public sector organisations.

Some possible questions for consideration include:

- What might be missing?
- Is there anything that does not fit with the lived experience of innovation measurement or its use in the public sector?
- Does the report adequately provide an overview of the relevant factors for measurement of innovation?
- Are there additional (or better) examples or case studies that could be used to illustrate the process of measuring innovation?

Feedback can be provided to the Observatory of Public Sector Innovation team at opsi@oecd.org. This will contribute to a beta version of the report, which will then be tested with representatives from OECD member countries and interested public servants as part of the broader innovation lifecycle series.

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Annex A. OECD public sector innovation expert consultation: list of proposed measures

Resources:

- In-house activities, such as in-house research; planning and design; market research and other user studies; feasibility studies, testing and other preparatory work for innovation;
- Contract research to universities or public research institutions;
- Training and education of staff for innovation;
- Consultancy or other business services for innovation;
- Acquisitions of new equipment and software for innovation.

Linkages:

The following list identifies the main types of partners that could be included in surveys:

- Private businesses;
- National government organisations;
- Regional or local authorities;
- Not for profit organisations, NGOs, interest groups, or business associations;
- Universities / government research institutions;
- Other public organisations;
- Individual citizens.

Sources of ideas:

- Ideas from senior management;
- Ideas from other personnel;
- Ideas from private businesses;
- Examples of best practice by other government organisations; including at the local level
- Professional organisations;
- Participation in conferences by staff or management;
- Feedback from citizens and other users of government services.

Political forces

- Increases in budget for the organisation;
- Reductions in budget for the organisation;
- New laws or regulations;
- Changes required by other organisations (e.g. new procedures or services, organisational changes, deregulation);
- Directives to implement new IT systems;
- New policy priorities;
- Problem or crisis requiring an urgent response.

Organisational context

- An aspect of this is incentive structures, both for individuals and the organisation itself
- Cultural factors: attitudes to risk/change, incentives, perceived barriers;
- The close inter-relation between strategy, management and structuring of innovation;
- Certain types which may be more relevant to the public sector: policy-driven, externally sourced, bottom-up;
- The overarching barriers and framework conditions.

One can thus identify positive (drivers) and negative (barriers) factors:

- Political factors
- Flexibility in laws and regulations;
- Incentives for the organisation as a whole to be innovative;
- Budgetary funding;
- Local accountability structures (e.g. user groups, elected members).
- Organisation and culture
- Risk averse culture in your organisation;
- Reluctance to embrace new ways of working or to experiment with new solutions;
- Cooperation within your organisation;
- Autonomy to implement innovations.

Other internal conditions

- Time allocated to innovation;
- Incentives for staff to innovate;
- Access to comparable performance data;
- Quality of IT infrastructure.

External conditions

- Effect of contractual rules on collaboration with suppliers;
- Main suppliers' capability to provide innovative solutions;
- Resistance of users to change;
- Demand for new services or products;
- Availability of qualified staff.

Objectives and effects/outcomes

- Among factors that have been included in recent studies either as objectives or effects are:
- Address social challenges (e.g. health problems, inequalities, others);
- Fulfil new regulations, policies or other politically mandated changes;
- Enabling the organisation to offer services to more or new types of users;
- Enabling faster delivery of services;
- Simplifying administrative procedures;
- Reducing costs for providing services;
- Improve user satisfaction;
- Improve online services;
- Improving user access to information;
- Improve working conditions for employees.

Measures of impacts covering both internal and external dimensions:

- Impacts on the quality of goods and services;
- Costs, efficiency;
- Users: satisfaction, access to information.

Examples of indicators:

- Effect on costs for the provision of services or the fulfilment of the organisation’s service obligations;

- Share of services that are new or significantly improved;
- Scope of service innovations in terms of number/share of users affected.

Suggested questions:

- Type of innovations (product, process, organisational, and communication – possibly policy)
- Innovative novelty (product and process)
- Who developed the innovation (product and process)
- Example of most successful innovation
- Human resources for innovation
- Information sources
- Innovation cooperation
- Policy-related drivers
- Innovation strategies
- Barriers
- Effects

New questions suggested for testing:

- Transformative innovations
- Impact of procurement on suppliers' innovation
- Actions to overcome barriers to innovation
- Additional questions:
- Politically-mandated innovations
- Ad-hoc innovations
- Training and other innovation activities (qualitative question)
- Questions on the most successful innovation
- Questions for discussion