Towards an Integrative Framework of Innovation Capacity

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ABSTRACT

Prior research has emphasized the major role of innovation capacity (IC) for public sector organizations (PSOs). Nevertheless, what constitutes IC for PSOs is under-conceptualized. Based on a systematic literature review (112 records) and an expert survey (18 experts from 13 countries), this article is designed to develop an integrative and dynamic framework for IC in PSOs. The framework proposes to integrate six interrelated dimensions of IC: learning capacity, connective capacity, ambidexterity, risk monitoring, leadership and technological capacity. These six collective capacities are variously activated according to the innovation phases. The framework suggests that a lack of or a failure of innovation in PSOs might result from unbalanced attention to one or more of these six dimensions of IC. Therefore, this IC framework provides a diagnostic tool to identify such capacity gaps. Finally, this article identifies management strategies that might contribute to overcoming gaps in PSO ICs.

Key Words: Innovation capacity, public sector organizations, collective capacities, systematic literature review, expert survey, conceptual framework, public sector innovation

Introduction

The aim of the present paper is to develop an integrative and dynamic framework of innovation capacity (IC) for public sector organizations (PSOs). IC is considered an organizational capacity whose specific outcome is innovation (Andrews, Beynon and McDermott, 2015). This endeavour is relevant for both practical and theoretical reasons.

For PSOs in practice, such a study is relevant because, in addition to ongoing budget cuts, PSOs are increasingly facing new political, economic and social challenges, and citizens' expectations. At the same time, they should keep creating public value (Bryson, Crosby and Bloomberg, 2014; Crosby, Hart and Torfing, 2017). In this context, many scholars (Borins, 2014; Daglio, Gerson and Kitchen, 2015; Lewis, Ricard and Klijn, 2017) and institutions (Casebourne, 2014; Mulgan, 2014; OECD, 2017; Daglio, Gerson and Kitchen, 2015) place innovation high on the research and government agenda. In practice, PSOs can outsource innovation processes, e.g. to external consultants and *labs*. However, literature suggests that innovation is likely to be more adapted, more sustainable, and more accepted (at least internally) when it results from the organization's own capacities (Farazmand, 2009; Meijer, 2018). To foster their organizational innovativeness, public managers need to understand what constitutes IC for PSOs, which brings us to the theoretical relevance of the study.

From a theoretical perspective, hardly any comprehensive framework of IC for PSOs exists. The existing studies scrutinize specific aspects of IC, such as collaboration (Sørensen and

Torfing, 2016), leadership and networks (Lewis, Ricard and Klijn, 2018), technological capacity (Lember, Kattel and Tõnurist, 2018), inter-organizational learning (Hartley and Rashman, 2018) or institutional culture (Boukamel and Emery, 2018). In other words, the very nature of IC for PSOs as a whole is still under-conceptualized.

The paper by Gieske, van Buuren, and Bekkers (2016) is a notable exception as it attempts to build an integrative framework. The authors state that IC is a multi-level (implying individuals, organizations and networks) and a multi-faceted concept. The facets include, firstly, connective capacity to establish and maintain connections between different contents and actors; secondly, ambidextrous capacity to balance exploitation and exploration activities; and, finally, learning capacity to create, acquire, combine, code and apply knowledge and to adapt organizational routines accordingly.

Although this paper provides additional insights into current knowledge, and has been used in subsequent models (Meijer, 2018), the authors themselves perceive the need for further improvements. Two main elements are missing. On the one hand, the method that is used might not be sufficient to fully capture the levels and dimensions of IC. In fact, the authors mainly build on three streams of literature to construct their framework: innovation studies, organizational sciences and network sciences. Arguably, added streams of literature ought to be incorporated into the framework. On the other hand, some frameworks do not elaborate on the requirements related to the different phases of the innovation cycle (Eggers and Singh, 2009; Glor, 1998). Four phases of the innovation process, for instance, could be distinguished: the generation, the selection, the implementation and the diffusion of ideas.

The present paper aims at filling these gaps by constructing an integrative and time-dynamic framework of IC for PSOs following a two-step approach (see section 2 for more details). In a first step, a preliminary framework is constructed, based on a deep systematic literature review. This preliminary framework is described in section 3. In a second step, the framework is consolidated with a survey of international experts on public sector innovation, leading to a proposition for a final version of the framework. This final framework appears in section 4, and is discussed in section 5.

Methodology

Before outlining the two main methodological steps of this research, the conceptual boundaries of public sector innovation must be delimited. In fact, public innovation is often fuzzily defined and sometimes not defined at all in the research (De Vries et al., 2015; Osborne & Brown, 2011b). Besides, innovation has a positive connotation (Berkun, 2010). Subsequently, public servants tend to use it for any project, even though it is just change or improvement (Arundel and Huber, 2013). Based on the literature, we consider that public innovation - which can either concern technology, organizational process and structure (management), policy and programs, service delivery or other-, must meet the four following criteria. Firstly, an innovation refers to the whole process, from the idea to the implementation. An idea which has not been implemented should not be called innovation. Secondly, an innovation is innovative because it is perceived as new by its adopters (Rogers 1995). Thirdly, public innovation is not an end in itself.

It must seek to improve the functioning and outcomes of the public sector (Hartley 2005) and thus create public value (Moore and Hartley 2008). Finally, an innovation always represents discontinuity with the past. In that sense innovation is different from the concepts of change and improvement which concern the improvement of existing policies, processes, technologies and services, in continuity with the past (Osborne & Brown, 2011b). In this sense, incremental innovations are excluded by our definition, which focus on radical innovation.

Step 1: Systematic Literature Review

The first step of this research consisted of the construction of a preliminary framework of IC for PSOs based on a systematic literature review (Torraco, 2005).

Literature Search

Eligible studies were identified thanks to three strategies (Cooper, 2010). Firstly, we used Gieske, van Buuren and Bekkers (2016) references, which constitute a first attempt at conceptualization of IC. In their paper, they summarized an interesting body of literature around mainly three streams of innovation: innovation studies, organizational sciences and network sciences. This literature review consists of 138 studies.

We also included studies extracted from the article by DeVries, Bekkers and Tummers (2015), a robust and recent systematic literature review on innovation in the public sector. This literature review consists of 181 records.

Then, we conducted our own literature search through three scientific online databases (Web of Science, Scopus, and Google Scholar) in February 2018 to scan for more recent references, or important studies that were neglected in the two above-mentioned literature reviews. We used the following key words: innovat*, public sector*, capac* and capab*. We excluded studies that were already included in the literature reviews by Gieske, van Buuren and Bekkers (2016) and DeVries, Bekkers and Tummers (2015) in order to avoid including them twice. This final strategy of literature selection led to the inclusion of 81 extra studies.

Eligibility criteria and study selection.

We applied strict criteria to select records among these 400 studies. Firstly, studies should be peer-reviewed articles. Secondly, they should discuss innovation in the public sector and, more precisely, innovation as a process, a collective or an individual capacity.

Thirdly, studies should be in English or in French, knowing that there is a very specific French management literature (Mangematin and Belkhouja, 2015). However, these strict criteria led to the selection of only 50 studies among the selected literature, as Gieske, van Buuren and Bekkers (2016) article contains many private sector studies and some publications written in Dutch. Additionally, DeVries, Bekkers and Tummers (2015) study contains many articles which are not specifically devoted to IC, but more to innovation as an output, and public management reforms more generally.

Subsequently, we decided to widen our selection criteria:

- Well-cited books, reports, and PhD dissertations should be included. In fact, there are books from well-established researchers and a few reports from innovation labs, governments and from the OECD that are particularly interesting in terms of IC for PSO.

- Seminal IC contributions should be included, even if they are not specific to the public sector.

Study selection output

In total, 112 records constitute the literature review, referring to studies published between 1973 (Granovetter's work) and 2018. Among these 112 records[1], 87 are studies dedicated to the public sector (including 67 peer-reviewed articles, 13 books or book sections, and seven reports) and 25 studies do not specifically discuss public sector issues (including four books and book sections, 20 peer-reviewed articles, mainly seminal contributions, and one PhD dissertation).

Subsequently we extracted, coded and analysed all the explicit and implicit elements which are supposed to be internal determinants or components of the collective capacity to generate innovation (IC). After an open coding, we proceeded to arrange arguments into meta-nodes, implying the merging of similar ideas. For instance, collaborative capacity was merged with connective capacity as collaboration relies on connection, even if the concepts are slightly different. Besides the constituents of IC, we extracted from the studies elements on innovation process phases and levels.

This step led to the construction of the preliminary framework for IC in PSOs which is summarized in Appendix 1 and whose content is presented in Section 3.

Step 2: Expert Survey

In a second step, the preliminary framework (section 3) was consolidated thanks to the results of an expert survey (Landeta, 2006). This survey involved sending the preliminary framework and its description to a pool of international experts on public sector innovation, and inviting them to comment openly on the framework

Experts were selected to be part of the pool if they had published and/or communicated in international conferences on the topic of public sector innovation. In total, 62 scholars worldwide were asked to be part of the pool including:

- Eighteen active contributors to the Public Sector Innovation Conference (PUBSIC) held in November 2017 in Lillehammer, Norway.
- Nineteen scholars from the European LIPSE project on public sector innovation.
- Six scholars from permanent study groups on public sector innovation at AIRMAP (Association Internationale de Recherche en Management Public) and EGPA (European Group for Public Administration) conferences.
- Nineteen influential and highly cited scholars in the field.

In total, 25 experts agreed to answer the survey, and 18 experts, representing 13 different countries and one international organization (OECD), actually delivered feedback. The final pool of experts who contributed is described in Table 1.

[1] The entire list of references is available on request to the authors. The main references for this literature review appear in the list of references at the end of this article.

Table 1: Description of the Pool of Experts

Expert	Country	Academic Position	Institution
Anne Rousseau	Belgium	Professor	KU Leuven
Bertrand Meunier	Luxembourg	Research Fellow	Luxembourg Institute of Science and Technology
Caroline Fischer	Germany	PhD Candidate	Universität Potsdam
David Carassus	France	Professor	Université de Pau et des Pays de l'Adour
Emmanuel Coblence	France/Canada	Professor	ESG Paris / HEC Montréal
Erkki Karo	Estonia	Professor	Ragnar Nurkse School of Innovation and Governance
Giorgia Nesti	Italy	Professor	Univesità delli Studi di Padova
Jenny Lewis	Australia	Professor	University of Melbourne
Katja Lindqvist	Sweden	Research Fellow	Lund University
Lykke Margot Ricard	Denmark	Professor	University of Southern Denmark
Nemec Juraj	Czech Republic	Professor	Masaryk University
Pierre Marin	France	Research Fellow	Université de Pau et des pays de l'Adour
Pierre-Jean Barlatier	France	Professor	EDHEC Business School
Sabine Junginger	Switzerland	Research Fellow	Hochschule Luzern
Timurs Umans	Sweden	Professor	Linnaeus University
Piret Tonurist	OECD	Research Fellow	Observatory of Public Sector Innovation
Kevin Richman	OECD	Research Fellow	Observatory of Public Sector Innovation
Wouter van Acker	Belgium	Research Fellow	KU Leuven

Experts' feedback was coded with NVivo software using deductive coding in a first step and inductive coding in a second step (Avenier and Thomas, 2015). The first step consisted of gathering all the gross arguments in *a priori* established meta-nodes (categories), respectively concerning the different aspects of the framework, following deductive coding. The main meta-nodes were 'time' (this node included feedback about how the innovation process was described), 'dimensions of IC' and 'levels and actors of IC'. Uncategorized feedback was categorized in the 'general proposition' meta-node.

The characteristics of the codes appear in Appendix 2. The number of references (number of times this idea was suggested) and sources (number of experts who suggested it) are indicated for each meta-node. Each node includes a quoted example.

In a second step, and complementarily, open inductive coding was used, with *ad hoc* nodes (Glaser, 1992) within each identified meta-node. These nodes included similar feedback. The results of the expert survey appear in Section 4.

Literature Review: Construction of the Preliminary Framework

This section presents the outcome of the literature review that led to the preliminary IC framework. The preliminary IC framework, summarized in Appendix 1, includes four collective capacities and three levels.

The Four Collective Capacities that Compose IC

The learning and connective capacities are approximately the same concepts as in Gieske, van Buuren and Bekkers (2016). Due to space limitations, they are explained below briefly. However, the ambidextrous and risk management capacities are elaborated further.

Learning capacity

Organizational learning is a concept that has been widely discussed in the management literature. According to Hartley and Rashman (2018), based on Nonaka (1994) and Polanyi (1966), organizational learning refers to a socially constructed and contextually embedded collective practice, underpinned by the concepts of explicit and tacit knowledge. Learning capacity refers to the collective capacity to develop and maintain these knowledge-influenced practices. More specifically, learning capacity is defined as a complex social and multi-level construct which implies the accumulation of tacit and explicit knowledge through myriad channels such as idea generation, recombination, observation, imitation and experience (Gomes and Wojahn, 2017; Chiva, Ghauri and Alegre, 2014; Easterby-Smith and Lyles, 2011). Furthermore, learning capacity implies a collective reflective attitude towards regular learning routines and norms (Duijn, 2009: 198-199; Gieske, van Buuren and Bekkers, 2016: 4).

The relationship between learning capacity and innovation has also been widely discussed in the management literature (Chiva, Ghauri and Alegre, 2014; Jiménez-Jiménez and Sanz-Valle, 2011) as well as in the public administration literature (Hartley and Rashman, 2018; Behn, 2010; Choi and Chandler, 2015; Kim and Lee, 2006). When an organization is able to learn, it is more likely to absorb accommodate ways of doing things and opinions which are prerequisites for innovation (van Acker and Bouckaert, 2018). Learning is both individual and collective, and learning at these two levels is interrelated: organizational learning incorporates what is learned on the individual level (e.g. team level in organizational routines), and vice versa (Crossan, Lane and White, 1999). Dynamic capabilities authors emphasize the prominent role of collective and reflective routines of learning for the emergence of change and innovation (Piening, 2013; Zollo and Winter, 2002).

Connective capacity

Current literature no longer considers innovation in the public sector as an internal process, mainly resting on internal resources and capacities (Weber and Khademian, 2008; Hartley, Sørensen and Torfing, 2013; Torfing, 2018). Innovation in the public sector strongly relies on an open collaboration process between internal and external actors, services and organizations (Bekkers and Tummers, 2018; Voorberg, Bekkers and Tummers, 2015; Miao et al., 2018).

Although collaboration is one of the most essential factors of innovation, it is particularly hard to develop because both the traditional Weberian public administration (e.g. through

specialization) and New Public Management (NPM) reforms (e.g. through agencification) tend to hinder transversal collaboration and constitute silos (Kinder, 2013, 2012).

Yet, collaboration relies on connections between individuals: connectivity between actors is a broader concept and a prerequisite for collaboration. Connected individuals can actively collaborate, or simply and passively know and trust each other, linked by both strong and weak ties (Granovetter, 1973). Furthermore, both active and passive connections, and formal and informal "without the burden of formal responsibilities, positions and rule", have been shown to enhance public sector innovation (Lewis, Ricard and Klijn, 2018: 292).

Therefore, connective capacity refers to the individual and collective capacity to develop and maintain connections between external and internal actors and knowledge (Fenger, Bekkers and Fenger, 2012; Ansell and Torfing, 2014; Gieske, van Buuren and Bekkers, 2016: 4), and this capacity is a key driver of public sector innovation. PSOs can foster connective capacity, particularly by providing employees with a favourable work arrangement, a collaborative culture, and motivation to collaborate (Klijn, Edelenbos and Steijn, 2010; Weber and Khademian, 2008; Thomson, Perry and Miller, 2007).

Ambidextrous capacity

Exploitation (i.e. processing and incrementally refining the core production) and exploration (i.e. prospecting new opportunities and innovation) are both essential activities for organizations (March, 1991). However, these two activities rely on contradictory processes, cultural values, structures, routines and skills, and compete for resources (Smith and Umans, 2015). Subsequently, the necessary reconciliation of exploitation and exploration generates tensions (March, 1991; Duncan, 1976; Raisch et al., 2009).

In a strict sense, organizational ambidexterity is defined as the ability of the organization to balance exploitation and exploration and resolve the resulting tensions (Duncan, 1976; Raisch et al., 2009; March, 1991). In a broad sense, this ability relies on behaviours, routines, skills and values on every level. We thus consider that organizational ambidexterity can be considered a collective capacity.

A distinction between two types of ambidexterity is often used in the literature. On one hand, structural ambidexterity refers to a situation in which exploitation and exploration are processed by different structures (O'Reilly and Tushman, 2013; Huang and Kim, 2013; Fang, Lee and Schilling, 2010). On the other hand, contextual ambidexterity denotes a situation in which a context is created by structures, routines, belief, etc. that supports individual ambidextrous behaviours. In other words exploitation and exploration are simultaneously processed by the same structures and individuals (Gibson and Birkinshaw, 2004; Birkinshaw and Gibson, 2004).

Studies on ambidexterity in the public sector are scarce. Based on the private sector literature, although both modes of ambidexterity could contribute to IC for PSOs, structural ambidexterity is faced with a dilemma of having close exploitation and exploration structures, which is problematic for the necessity for cognitive distance in innovation, and having clearly separated structures, which can shrink legitimacy of the exploration structure (O'Reilly and Tushman, 2013; Gibson and Birkinshaw, 2004). Conversely, theoretical studies suggest that

contextual ambidexterity is an asset for optimal involvement of first-line bureaucrats, legitimation and communication along the innovation process, even though it is harder and more expensive to implement (Boukamel and Emery, 2017). Gieske, Duijn and van Buuren (2019) have shown that contextual ambidexterity in public organisations supports interaction and mutual reinforcement of innovation and incremental improvement or exploitation.

Risk governance/management capacity

Risk management capacity for innovation is less developed in the literature than the three previous collective capacities. One reason for this scarcity is the recent interest in soft barriers to innovation in PSOs. However, risk aversion constitutes one of the main soft barriers to innovation processes (Flemig, Osborne and Kinder, 2016; Osborne and Brown, 2011a), and particularly within the public sector, which is characterized by a risk avoidance culture (Boukamel and Emery, 2018), and risk minimization (Osborne and Brown, 2011b).

Three reasons, at least, can explain why PSOs are less likely to take risks than their private counterparts (Bhatta, 2003). Firstly, risk taking is likely to impact public interests and people's lives in the public sector (social protection, health, defence, etc.). Secondly, public sector decisions commit public funds which are to be democratically allocated. Thirdly, laws and regulations do not always allow risk taking in PSOs.

Few authors have discussed the relationship between risk and innovation in PSOs in detail. Among them, Brown and Osborne (2013: 198) call for the development of a governance of risk, which consists of a process involving various actors in a transparent negotiation on the "acceptable levels of risks" and, eventually, "comprehensive participation in [their] governance". Based on Renn's (2008) work, the authors suggest that the more radical the innovation, the more PSOs must adopt a risk governance approach. Conversely, traditional risk management practices might be enough for non-complex innovations.

Nevertheless, risk (which can be planned) and uncertainty (which cannot) are not distinguished in this framework. To fill this gap, Flemig, Osborne and Kinder (2016) developed a framework, in which risk management approaches can be either hard (based on formal and standardized practices and techniques, mainly top-down), or soft (based on communication, transparency and joint decision-making, mainly people-driven). Although hard risk management is sufficient to tackle known risks (as opposed to uncertainty), it is hardly suitable by itself in cases of uncertainty. Therefore, both hard and soft risk management approaches are needed to deal with risk and uncertainty along the innovation process.

Finally, research has shown that individual risk aversion is likely to emerge in contexts in which failures are clearly sanctioned, whereas success is hardly rewarded (Albury, 2005; Raipa and Giedrayte, 2014; Townsend, 2013). Thus, PSO risk management is also related to a balanced system of rewarding though formal and informal practices and a 'right to fail'.

Concerning the IC framework, inputs from the risk management stream of literature—including Brown and Osborne (2013), Flemig, Osborne and Kinder (2016); Townsend (2013); Brown and Osborne (2013) can be used to conceptualize the risk management capacity:

1. The whole process of innovation is concerned with risk management capacity, as risks and uncertainties may evolve and appear at any time.

2. A smart risk and uncertainty management requires that the PSO combine hard risk management practices and soft risk management supportive processes by providing individuals with flexibility, trust, the right to fail and space for creative risk management, and by ensuring communication between front line employees and leaders.

3. Risk management capacity implies that individuals and teams communicate both horizontally and vertically (and with external networks) in order to identify risks, to participate in the risk governance approach, and to be constantly creative in tackling uncertainty.

The Three Levels of IC

As stated by Gieske, van Buuren and Bekkers (2016), IC is a multilevel construct and involves the individual, organizational and network levels. In line with their work, and based on the literature review, three levels are involved in the IC for PSOs. However, many studies focus mainly on one or two of these levels. While IC is often studied at the macro level (organization), it does not exist as such, but relies on individual skills and behaviours. Conversely, high levels of individual skills to innovate do not guarantee the organization will innovate, because various factors play a role in successful innovation at the collective level. In other words, and in line with the systemic epistemology, IC results from more than the sum of individual innovative skills and behaviours. For these reasons, we assume that the IC of PSOs requires an alignment of collective and individual features, skills and behaviours.

The role of individual entrepreneurship, creativity and innovation skills in innovation processes has been widely studied in relation to the respective roles of public employees, public managers and leaders (Borins, 2000; Lewis, Ricard and Klijn, 2017; Smith and Umans, 2015; Windrum and Koch, 2008; Bartlett and Dibben, 2002; Morris and Jones, 1999). The team level (work group) is also highly relevant (Harter, Schmidt and Hayes, 2002).

However, individuals cannot innovate by themselves. The collective level, including the pooling of each individual plus the output of their interaction, is as important for IC as individuals. In PSOs, the collective level is mainly embodied in the organization. The so-called organizational and internal network level is incorporated in IC of PSOs, as, internally, it can provide individuals and teams with innovation supporting conditions such as structures, culture, resources, rules, work design, strategies, knowledge, etc. (Palm and Lilja, 2017; Emery et al., 2016; Wynen et al., 2014; Fernandez and Moldogaziev, 2013).

Thirdly, the external network level strongly contributes to IC of PSOs by providing the PSO with the resources and knowledge it needs for innovation. The external network of individuals and organizations is of particular relevance for public sector innovation, which increasingly relies on collaborating, transferring knowledge and ideas, overcoming silo barriers, or giving access to broad knowledge (Crosby, Hart and Torfing, 2017; Boukamel, 2017; Hartley and Rashman, 2018; Lewis, Ricard and Klijn, 2018; Gieske, van Meerkerk and van Buuren, 2018).

Conclusion on the Preliminary Framework of IC

To conclude, the literature review which is synthetized here led us to construct a preliminary IC framework, composed of four collective capacities (learning, connective, ambidextrous and risk management) at three levels (external network, organization, and individual and teams).

The four collective capacities form a preliminary framework which appears in Table 2. This bundle of collective capacities has two particularities. Firstly, the collective capacities are not exclusive: they are partly overlapping and interrelated. For instance, the collective capacity to manage risk relies on the collective capacities to learn and to connect. Secondly, although IC relies on these four collective capacities jointly, IC can exist without engaging all four. We also assume that these collective capacities can be activated at different intensities.

Table 2: Synthesis of the Four Collective Capacities Included in the Preliminary Framework of IC

Collective capacity	What	How	When	Who
Learning	Collective capacity to accumulate tacit and explicit knowledge, and to reflect on regular learning routines.	Absorbing, recombining, creating and experimenting with knowledge.	Throughout the innovation process, and particularly at the beginning (idea emergence requires knowledge) and at the end, to institutionalize new knowledge into routines.	Individual and collective levels.
Connective	Collective capacity to develop and maintain connections between internal actors and content, and between internal and external actors and content.	Coordinating, socializing, trusting, overcoming borders.	Throughout the innovation process.	Every internal and external actor.
Ambi-dextrous	Collective capacity to balance the antagonistic rationalities of innovation and exploitation systems, and to manage the resulting tensions.	Balancing flexibility and control or creating specialized structures, allocating resources to both systems.	Throughout the innovation process, particularly during the creation and implementation phases (both result in generating high tensions between innovation and exploitation).	Organizations, management and individuals—e.g. via strategies, structures, routines.
Risk management	Collective capacity to develop, maintain, and adapt soft and hard risk management routines and culture.	Collecting information, involving actors, supporting risk taking, communicating and creating safe spaces.	Throughout the innovation process, particularly during idea selection (when risk governance should be set and incertitude is great) and during institutionalization (when risk aversion is one of the main barriers).	Mainly organization and supervisors for hard risk management, each actor for soft risk management.

Individual and collective levels are not opposed: individuals make up the collective level, but the latter is more than the sum of the former. Besides, we assume that IC, in addition to being a passive bundle of capacities, is differently activated according to the innovation process phase. The four phases we incorporated in the framework (generation, selection, implementation and diffusion of ideas) are further described in Appendix 3 (Eggers and Singh, 2009). It is noteworthy that alternative frameworks of innovation exist in the literature, with three, five, or six phases, for instance (OECD, 2017, Glor, 2003; Rogers, 1995). Glor's framework, for instance, is very useful to understand the complexity of the innovation process. Building on Rogers (1995), she defined the innovation process as involving: readiness, negotiating approval, effective implementation, a focus on results, and learning. Learning inputs to each of the other stages. However, our four-phase framework seemed to be comprehensive without being excessively complex. We selected it to avoid overcomplicating the model, which would have the consequence of confusing the experts. Although four phases emerged from the literature, it is noteworthy that the innovation process is not seen as linear and sequential: its phases overlap, and iteration and feedbacks loops exist between the phases.

Results of the Expert Survey on the Preliminary Framework

This section shows the results of the expert survey.

Remarks on the Conceptual Foundation of IC and its Collective Capacities

As a first point, the experts remarked on the lack of clarity around the concept of IC on the one hand, and on collective capacities in general, on the other hand. Among others, the experts suggested clearly delimitating the conceptual boundaries of IC and clarifying the relationship among the various (numerous) concepts. This conceptual issue is, according to us, very important, as it is likely to underpin many other remarks that experts made on the preliminary framework. The following conceptual issues remain unclear in the preliminary framework:

- What is a collective capacity (e.g. collective learning capacity)
- How does collective capacity differ from individual capacity?
- What is the link between the collective capacities that compose IC and IC (dimensions, antecedents, etc.)?
- Do PSOs need to cumulate all the collective capacities that compose IC to be innovative, or conversely, can PSOs produce innovation without the entire collection of collective capacities that compose IC?

Remarks on Which Collective Capacities Compose IC

Besides these remarks on the nature of the concept of IC and collective capacities, the experts remarked on the collective capacities that were described in the preliminary mode as constituents of IC.

Experts remarked on the four collective capacities of the preliminary framework, and more particularly on the ambidexterity and risk management capacities. On the ambidexterity capacity, experts made two kinds of remarks. On the one hand, they remarked on the fact that ambidexterity is a meta-capacity which underpins the others. This suggests that ambidexterity is conceptualized as a meta-capacity. On the other hand, they suggested that our conception of ambidexterity was too broad. In fact, we incorporated in the concept the capacity to manage the tensions resulting from the exploitation-exploration trade-off. For some experts, this is beyond the scope of ambidexterity. Finally, experts suggested distinguishing more how ambidexterity is differentially activated according to the advancement phase of the innovation process.

Concerning the so-called risk management capacity, experts suggested clarifying how it constitutes a collective capacity and not treating it simply as a cultural prerequisite, a mind-set or a simple organizational practice (operational risk management). While uncertainty is discussed in the literature review, it is not incorporated enough in the preliminary framework, according to the experts.

Experts further remarked that two main dimensions of IC seemed to be missing from the preliminary framework: leadership and technologies. This was one of the main comments from the experts. Leadership was only related to risk. We recognize that innovation is very much based on individual and collective leadership. Leadership for innovation includes political and administrative leadership from top managers, but also from individual actors involved in the network.

Furthermore, according to the experts, the IC of PSOs is strongly related to technology, not only as a tool, but also as a collective capacity to mobilize appropriate and meaningful technology for innovation. This technological capacity relates to both hard aspects (what technology the organization provides employees with) and soft aspects (a mind-set, a culture of ICT and data). For experts, innovation in PSOs often relies on the propensity and capacity of leaders to use appropriate technology.

Remarks on the Level and the Opposition of Organization/Individual

In the preliminary framework, individuals were clearly separated from collective levels. This resulted in a conceptual confusion: what is the collective level if it is not composed of individuals? Experts suggested solving this issue.

Furthermore, in the opinion of the experts, the individual level should include political leaders alongside administrative leaders. Executive body political actors' leadership and political agendas play significant roles in the IC for PSOs.

Finally, experts suggested removing the external network level from the core of IC of PSOs. According to them, the external network is located in the environment. The framework is meant to describe precisely what IC means for PSOs. Yet, PSO as an entity does not incorporate within it, by definition, levels which are external to it. Thus, external networks should not appear in the framework at the core of IC of PSOs, but rather as an intermediate level between PSO internal levels and PSO environment. Connective capacity is precisely devoted to building and maintaining relationships between internal levels and external networks, among others. Various experts pointed to the fact that the preliminary framework design did not sufficiently highlight the role of connective capacity as a conduit.

Remarks on the Time Aspect

Experts converge in criticizing the linear and sequential naature of the innovation process as it is viewed in the preliminary framework. Even though feedback loops have been symbolized by arrows in the preliminary framework, overall it gives an impression of linearity. Linear approaches to innovation have been widely criticized. To overcome the linearity issue, one expert suggested adopting a vortex representation of the innovation process, which reports more complexity and non-linearity in decision-making processes, due to constant conflict and reiteration.

Moreover, the phases of the preliminary framework were criticized on three points. Firstly, experts called for more precision in the first phase, namely 'idea emergence'. Idea emergence suggests that ideas are emerging passively: that is why experts suggest calling this phase 'idea generation'. Secondly, experts called for a better description of the other phases' attributes. One of the main reasons for this is that the phases are sometimes related (e.g. idea emergence and selection phases). Finally, the last phase of the preliminary framework, namely the diffusion phase, referring to diffusion to external actors and institutions, was criticized. Experts doubted that diffusion of innovation fits with the role of a PSO. The role of the PSO is rather to diffuse innovation from local implementation (phase 3) to the whole organization's routines.

Remarks on the Complexity of the Framework and Empirical Issues

Experts asked whether the framework is meant to remain a theoretical framework or if it is intended to be empirically tested. For the moment, the framework integrates time and process attributes. Besides, actors and collective capacities are strongly interrelated and overlapping. This suggests that the current framework has typical systemic (or at least holistic) framework features. Yet, systemic frameworks are designed for the conceptualization of complex systems but hardly empower direct empirical applications. Subsequently, experts suggested anticipating empirical testing issues while building the framework—i.e. reducing the number of variables or disentangling the different levels.

In line with the former comment, experts addressed criticisms to the complexity of the preliminary framework. This framework, as it aims to be nested and dynamic, tends to be overly complex and risks being confusing for the reader. Accordingly, experts recommended finding a way to simplify the framework—for instance, by distinguishing the overall capacities of IC (which do not vary during the whole innovation process) and the specificities of the phases.

Towards a Refined Framework of IC

This section describes the modifications that are proposed to the framework, based on the experts' feedback, and introduces the proposition of a refined framework of IC in PSOs (Table 3). In brief, we make propositions to clarify the concepts and their relationships; to modify the content of the collective capacities that compose IC and to add two new ones; to redesign the time phasing of innovation processes; to anticipate empirical aspects; and to simplify the overall framework.

Table 3: A proposed Refined Innovation Capacity Framework

Dimensions of IC	**Process Description**	**Collective capacities**		**Innovation phase relevance**	**Strong links with the other CCs**
		Individual level	**Organizational level**		
Learning capacity	Absorbing, recombining, adapting and diffusing knowledge	Reflective attitude, openness to new ideas and creativity, empathy towards users' and colleagues' needs and issues, interpersonal trust-building.	Practices, routines and work design supporting socialization and coordination, knowledge integration and codification, communication, training, and creativity fuelled by passion, less pressurized work environment and belief diversity in teams.	• Phase 1: scanning issues and creating adequate knowledge • Phases 3 and 4: coding, diffusing and turning knowledge into routines	Connective capacity, ambidextrous capacity, technological capacity
Connective capacity	Developing and maintaining connections between internal actors and content internally and externally.	Socializing, preference for both strong and weak ties, building informal and formal relationships with a diversity of actors, networking capacities and trust-building capacity.	Practice and routines of network management, supporting socialization (events, seminars, etc.), training for networking, accrediting individuals for networking roles (functional specifications), and collaboration-adapted work design (flexible work time and workplace with adapted ICT tools).	• Phase 1: connecting in order to scan problems and generate ideas • Phase 4: diffusing the innovation	Ambidextrous capacity, technological capacity
Ambidextrous capacity	Balancing the antagonistic rationalities of innovation and exploitation systems, and managing the resulting tensions	Capacity to connect exploitation and exploration requirements and goals. Tolerance of multi-rational environments. Commitment and motivation towards exploitation and innovation systems.	Balancing strategies, policies, routines and resources supporting both exploitation and exploration. Identifying and adopting an appropriate type of ambidexterity (structural or contextual) according to culture, goals, and resources. Developing and maintaining an organizational culture of tolerance of ambiguity and multi-rationality.	• Phase 1: balancing time, resources, and motivation • Phases 2 and 3: pragmatically making the new ideas fit into existing exploitation processes and routines	Learning capacity, connective capacity, leadership capacity

Dimensions of IC	**Process Description**	**Collective capacities**		**Innovation phase relevance**	**Strong links with the other CCs**
		Individual level	**Organizational level**		
Risk monitoring capacity	Deploying an adapted approach to risk, identifying risks associated with stagnation.	Openness to risk taking, creativity (to tackle uncertainty), and entrepreneurship capacity; capacity to confer with other stakeholders on the acceptable level of risk. Capacity to take risks, to support colleagues in their risk taking and to be creative to tackle uncertainty. Involvement in the organizational risk strategy and governance.	Practices, routines and work design to develop a risk-tolerant culture, safe spaces for risk, a pro-innovative rewards system, and stimulate creativity by creating passion with a non-pressured work environment and diversified teams.	• Phase 1: supporting initiative and risky ideas through risk tolerance and failure culture and work design • Phases 2, 3 and 4: developing an appropriate approach to risk (hard/soft management).	Learning capacity, connective capacity, leadership capacity
Leadership capacity	Eliciting employees' and colleagues' perceptions of impact and meaning, psychological empowering, motivating.	Networking activities and lobbying with public managers, proactivity. Capacity to take opposition seriously, to evaluate innovation results objectively, and to motivate others for innovating.	Supporting entrepreneurial leadership by providing leaders with trainings and by supporting a collaborative and entrepreneurial culture. Practices and routines aimed at supporting innovation leaders to emerge and to lead innovations.	• Phase 1: entrepreneurial leadership to motivate individuals to generate ideas • Phases 2, 3 and 4: sense-making to make individuals understand the change.	Ambidextrous capacity, risk monitoring capacity
Technological capacity	Constantly scanning, adopting and using the most adequate technology to innovate.		Providing individuals with information on the most useful technologies, ICT skills, motivation to use ICT, and performant hardware tools.	• Phase 1: scanning ideas Phases 2 and 3: systematically trading off between ideas • Phase 4: communicating the changes and formalize the new processes.	Learning capacity, connective capacity, ambidextrous capacity, risk monitoring capacity

Propositions on What IC Is

As mentioned in the preliminary framework description, IC is seen here as a collection of collective capacities, plus an interaction effect between these collective capacities, leading to more than a sum of collective capacities. However, these collective capacities are not activated similarly according to the organizational context and needs. In the refined model of IC, we propose to consider the collective capacities that compose IC as cumulative and not exclusive: if one collective capacity is missing, IC still exists but in a different form.

Consequently, there must be a different profile for innovative PSOs according to the development of each constituent collective capacity. Thus, IC could be seen as an organic system, with collective capacities playing the role of organs.

Propositions on what Collective Capacities Are

The question of the nature of collective capacities is key to this article. More precisely, one can ask (like the experts) what the relationship is between individuals and collective levels. In fact, organizational levels do not exist by themselves: they result from the association of individuals. In turn, the way organizational levels are organized (structure, culture, work design, processes and routines) impacts the way individuals can collectively use their capacity. In this article, we conceptualize collective capacity as a dynamic process resulting from the effect of the collection of individual capacities and outputs institutionalized at an organizational level but also the effect of this organizational level on individual capacities and outputs. This conception was notably developed by Crossan, Lane and White (1999) in their seminal paper on organizational learning.

Propositions on Which Levels to Consider

We propose to redesign the levels as follows: individuals should be widened to include political actors (from the executive body), and the external network should be excluded from the direct collective levels.

Firstly, concerning the role of political leadership, even though the experts perceived political actors as key actors for public sector innovation, there is hardly any literature on their concrete role. Current research focuses more on the political leadership as an antecedent (Torfing and Ansell, 2017). In our refined framework, the level 'individuals' should also include political actors (executive authority), as a group of individuals, among the others (public employees, administrative leaders and managers).

Secondly, external networks should be excluded from the PSO level and be moved to the interspace between the PSO and its environment. Connective capacity must be redesigned in the refined framework to emphasize its role as a bridge between internal levels and external networks. This conception diverges from Gieske, van Buuren and Bekkers (2016) work, which incorporates the external network within the core of its framework.

Propositions on Which Collective Capacities Compose IC

In comparison with the preliminary framework, learning and connective capacities do not change. Ambidextrous and risk management capacities were adapted to the experts' remarks by

incorporating two extra collective capacities in the concept of IC: leadership for innovation capacity and technological capacity.

About the Ambidextrous Capacity

Regarding ambidexterity, we agree that the concept of ambidexterity is sometimes defined more narrowly in the literature than it is here: ambidexterity is defined only as the trade-off between exploitation and exploration (Tushman and O'Reilly, 1996). However trade-off approaches treat the exploration – exploitation tension as a dilemma and advocate finding an optimal compromise. Whereas more paradoxical approaches advocate a both-and approach (Smith and Lewis, 2011; Lövstål and Jontoft, 2017; Gieske, George, Van Meerkerk and Van Buuren, 2019). What we understand as ambidextrous capacity is the capacity of an organization to address the issues gravitating around the initial trade-off between exploitation and exploration. For instance, ambidexterity generates tensions that must be addressed collectively. Therefore, the concept of ambidextrous capacity has a broader scope than simply being able to deal with trade-offs and find optimal compromises. Rather, it entails being capable of dealing simultaneously with both exploration and exploitation, either by accepting the tensions, by temporal separation or by iterating between the two

We propose in the more sophisticated framework that ambidextrous capacity can also rely on individual motivation (Miao et al., 2018) to balance between the two activities. Furthermore, an ambidextrous capacity relies on so-called ambidextrous leadership or leadership ambidexterity (Rosing, Frese and Bausch, 2011), which enhances the reconciliation of the two systems. Besides, we differentiate the role of ambidexterity between the idea creation phase (1), in which ambidextrous capacity is more about balancing time, resources and motivation between exploration and exploitation, and the other phases (2, 3 and 4), in which ambidexterity is the capacity to pragmatically make the new ideas fit into the existing exploitation processes and routines.

About the Risk Management Capacity

Concerning the conceptual confusion around the concept of risk management capacity, the label 'risk management' is too much associated with hard risk management. According to Flemig, Osborne and Kinder (2016), risk management is right in the middle, as it is a combination of hard and soft elements and processes. We propose to rename this collective capacity 'risk monitoring capacity' in order to include soft elements of management too.

Moreover, we propose to distinguish uncertainty from risk in the refined framework, as suggested by the experts and based on the work of Flemig, Osborne and Kinder (2016). Risk monitoring capacity tackles both risk and uncertainty. Because it implies probable unplanned change all along the innovation process, uncertainty requires individuals to be constantly creative (Amabile et al., 2005) and the organization to support the creativity of individuals.

On the one hand, individual creativity encompasses divergent thinking skills, and the ability to communicate and persuade and to be open to colleagues' insights (Kruyen and van Genugten, 2017). The literature on public entrepreneurship can provide useful insights into individual creativity in the context of the public sector innovation process. Public entrepreneurs can be involved in the whole innovation process, from idea generation to implementation (Brouwer and Huitema, 2018). According to Borins (2000: 506), public entrepreneurs are

strategic public employees who proactively solve problems, especially by dealing with opposition, and developing visions and values. Complementarily, Hartley, Sørensen and Torfing (2013) consider that public entrepreneurship also dwells in an actor's inclusive mind-set (i.e. trust-based leadership, institutional and user integration).

On the other hand, the organization level can support public entrepreneurs, and therefore tackle uncertainty, by providing individuals with trust and room to fail (Brouwer and Huitema, 2018). Kruyen and van Genugten (2017) suggest that individual creativity in the public sector can be fostered by job and hierarchical autonomy, as well as an inspiring and facilitating layout of the workspace. On that last point, New Ways of Working (NWW) provide employees with an autonomy-oriented work design including choice in place and time of working, dynamic offices and digital communication tools, and could increase individual creativity (Moll and de Leede, 2017). Studies on NWW and innovation are though still scarce in the public sector.

Leadership for Innovation Capacity

Leadership was sorely lacking in the framework, although it is considered by the experts as a key pillar of IC in PSOs. Leadership encouraging innovation is distributed and concerns each level (individuals can be innovation leaders, whatever their hierarchical level, if the organization supports this) and acts complementarily to other dimensions of IC (e.g. ambidextrous leadership, etc.).We propose, therefore, to incorporate administrative and political leadership (executive body) for innovation as a fifth dimension of IC for PSOs.

What style of leadership fosters innovativeness in PSOs? This question is not very well discussed in the literature (Lewis, Ricard and Klijn, 2018). We therefore gathered various significant contributions to help to answer this question.

Miao et al. (2018) show that a specific style of leadership—entrepreneurial leadership—can foster innovative behaviour by increasing psychological empowerment. The authors show that entrepreneurial leaders encourage and support public employees to innovate in the workplace, providing them with favourable time and equipment for innovation and engagement in innovation processes. Entrepreneurial leaders work as role models for other innovators. One of the main observations of Miao et al. (2018) is that entrepreneurial leaders foster innovation in particular by enhancing employees' perceptions of impact and the meaning of innovation for society. This suggests that public leaders could motivate public employees to innovate while activating elements of public service motivation (Vandenabeele, 2007), even though de Vries, Tummers and Bekkers (2018) suggest that Public Sector Motivation (PSM) linked to innovation is less active for innovations which concern internal organizational practices. The research of Bos-Nehles, Bondarouk and Nijenhuis (2017) on the knowledge-intensive public sector organization also suggests that leadership to innovate consists of providing individuals with a favourable work climate, design and environment. In an original contribution, the authors emphasize the importance of the leaders supporting the innovation process through networking activities and also by lobbying public managers.

Lewis, Ricard and Klijn (2018) show that three styles of leadership foster IC in the public sector: entrepreneurial leadership, network governance leadership (oriented towards co-creation processes) and transformational leadership. Although the way authors capture IC can be

discussed (self-rated), their study suggests that PSOs need to rely not only on a single style of leadership to foster innovation, but also on a combination of the three leadership styles.

Fernandez and Moldogaziev (2013: 177) discuss what practices and routines organizations can implement to sustain individual motivation to innovate in the public sector. They show that "empowerment practices aimed at granting employees' discretion to change work processes and at providing them with opportunities to acquire job-related knowledge and skills are strongly, positively correlated with employee motivation to innovate." Conversely, they show that empowering employees with rewards based on performance, when performance is defined as an output, hinders individual innovativeness.

These elements can enrich the understanding of leadership to innovate, and the respective roles of administrative and political leaders. This should be further developed in future research.

Technological Capacity

The organizational capacity to scan future technological trends and to adapt its technological capacity accordingly has been recently conceptualized by Lember, Kattel and Tõnurist (2018). They suggest that e-technological capacity is "an ability to explore, develop and/or adapt new technological solutions in public service design, delivery and evaluation" (p. 217). In the refined model we propose to incorporate technological capacity to innovate as a sixth dimension of IC for PSOs.

The authors show that the technological capacity improves and fosters other collective capacities of a PSO, and particularly explain organizational ambidexterity. The concept of technological capacity includes both individual and collective dimensions. It needs to be further conceptualized.

Propositions on How Individuals and Organizations Could Develop and Maintain the Six Collective Capacities

Thus far, we have stated that IC of PSOs would be composed by a combination of six collective capacities. We have also stated that these collective capacities would be the product of the dynamic interaction between individuals' capacities and outputs on the one hand, and the organization's configuration on the other hand. Thus, one can ask: in what conditions do these individual and organizational levels fuel IC? In other words, how can the two levels support collective capacities to develop and sustain innovation? This issue also addresses the role of management of IC for PSO. To answer these questions, we considered the references the experts suggested, as well as the existing references from the literature review. The newly added content is described here.

For learning capacity, we used the work of Kruyen and van Genugten (2017), in which empathy towards users' and colleagues' needs and issues is described as an individual quality which drives creativity in the public sector. We also used the work of Siddiki, Kim and Leach (2017), which emphasizes the need for interpersonal trust-building for individual learning. At the organizational level, several works were added which suggest that organizations can support learning. These drivers of creativity and learning require specific training (Kim and Lee, 2006); a passion-driven work environment (Amabile, 2017); diversified teams (Kruyen and van Genugten,

2017); and, more particularly, diversity of beliefs within the team (as opposed to an affiliation diversity) (Siddiki, Kim and Leach, 2017).

For connective capacity, we used the work of Weber and Khademian (2008), which shows that individual networking relies on network builders who present a certain mind-set (e.g. committed to the rules yet thinking creatively). We also added the work of Brouwer (2015: 206), which describes relational management strategies as relying on trust-building and networking, individual capacities (i.e. "being reliable, stable, and predictable; demonstrating an open attitude, and communicating transparently"). At the organizational level, the connective capacity can be supported using transformative workplaces (Lindsay et al., 2018), and more globally by implementing empowering and pro-collaboration work design and physical work place arrangements, as conceptualized by NWW (Moll and de Leede, 2017; Keast and Brown, 2006).

In order to stimulate ambidextrous capacity, leaders can rely on a so-called ambidextrous leadership style (Rosing, Frese and Bausch, 2011), while organizations can support individual ambidexterity by flexible work arrangements such as New Ways of Working (but only in cases of contextual ambidexterity, in which individuals are encourage to engage in both exploitation and exploration activities). It is noteworthy that ambidextrous capacity might also be stimulated by the availability of appropriate technological tools. Thus, ambidextrous capacity partly relies on technological capacity.

For the risk monitoring capacity, individuals should first rely on their creativity to tackle uncertainty, as conceptualized by Flemig, Osborne and Kinder (2016). Individual creativity rests on several skills and behaviours and organizational supports (diversified teams, favourable work-design, etc.), that are described above for learning capacity (Amabile, 2017; Kruyen and van Genugten, 2017). In addition, risk capacity relies on the capacity of individuals to confer with other stakeholders on acceptable risk level as a prerequisite for risk monitoring.

For the leadership capacity, at the individual level, Bos-Nehles, Bondarouk and Nijenhuis (2017) show that entrepreneurial leadership is characterized by networking and lobbying activities, and Borins (2000) shows that policy entrepreneurs rely on proactivity and on their capacities to take opposition seriously and to objectively evaluate their innovation efforts. The organizational level can support this leadership to innovation with empowering practices, as described by Fernandez and Moldogaziev (2013).

Finally, which management practices support development of technological capacity has hardly been examined in the literature (Lember, Kattel and Tõnurist, 2018).

Propositions on Time Aspects

Subsequent to remarks on the over-linearity of the innovation process in our framework, we decided to represent the innovation process differently. Besides, changes were proposed to the framework description and to the graph in order to emphasize the non-linearity of processes and feedback loops. In fact, feedback and multiple loop systems of learning are intrinsic features of innovation and may be associated with innovation survival. In other words, the more feedback and learning loops an organization sets, the more an innovation will stand the test of time (van Acker and Bouckaert, 2018).

Based on the experts' comments, we propose to redesign the four phases as follows.

- Phase 1: The 'idea emergence' phase should be transformed into 'idea creation' to fit better with a more active conception of idea emergence, as requested by the experts.

- Phase 2: No change should be made to phase 2, 'idea selection'.

- Phase 3: Although the third phase should still be called the 'implementation' phase, it refers more to a preliminary or localized implementation through pilot projects and services. In other words, it is the pilot implementation.

- Phase 4: After the pilot implementation, the innovation is disseminated to the whole organization, changing the routines and structures and becoming 'the new normal'. The fourth phase refers to this internal diffusion, which is henceforth proposed to be called the 'institutionalization and routinization' phase.

Propositions to Anticipate Empirical Applications

The framework aims to incorporate complexity, as innovation is a complex phenomenon constructed by individuals and organizations, through mutual interactions. Therefore, the current theoretical framework is related to systemic epistemology. To be complete, systemic frameworks need to consider the environment, which is not done in the preliminary framework. In the case of innovation of PSOs, contextual elements such as the legal framework, other PSOs in the field, political agendas, citizen expectations, citizen needs, socio-demographic challenges, technological changes, administrative reforms, etc. are likely to interact with IC (Andersen and Jakobsen, 2018). Besides, public sector innovation relies on broader and more open networks (Sørensen and Torfing, 2012; Torfing, 2018). Therefore, the environment should be incorporated into the refined version of the framework (Figure 1).

Although the current framework is meant to seize a complex phenomenon theoretically and holistically, it is not incompatible with further empirical validations of specific parts of the framework. To anticipate empirical issues, we also simplified the framework. This is described in the next sub-section.

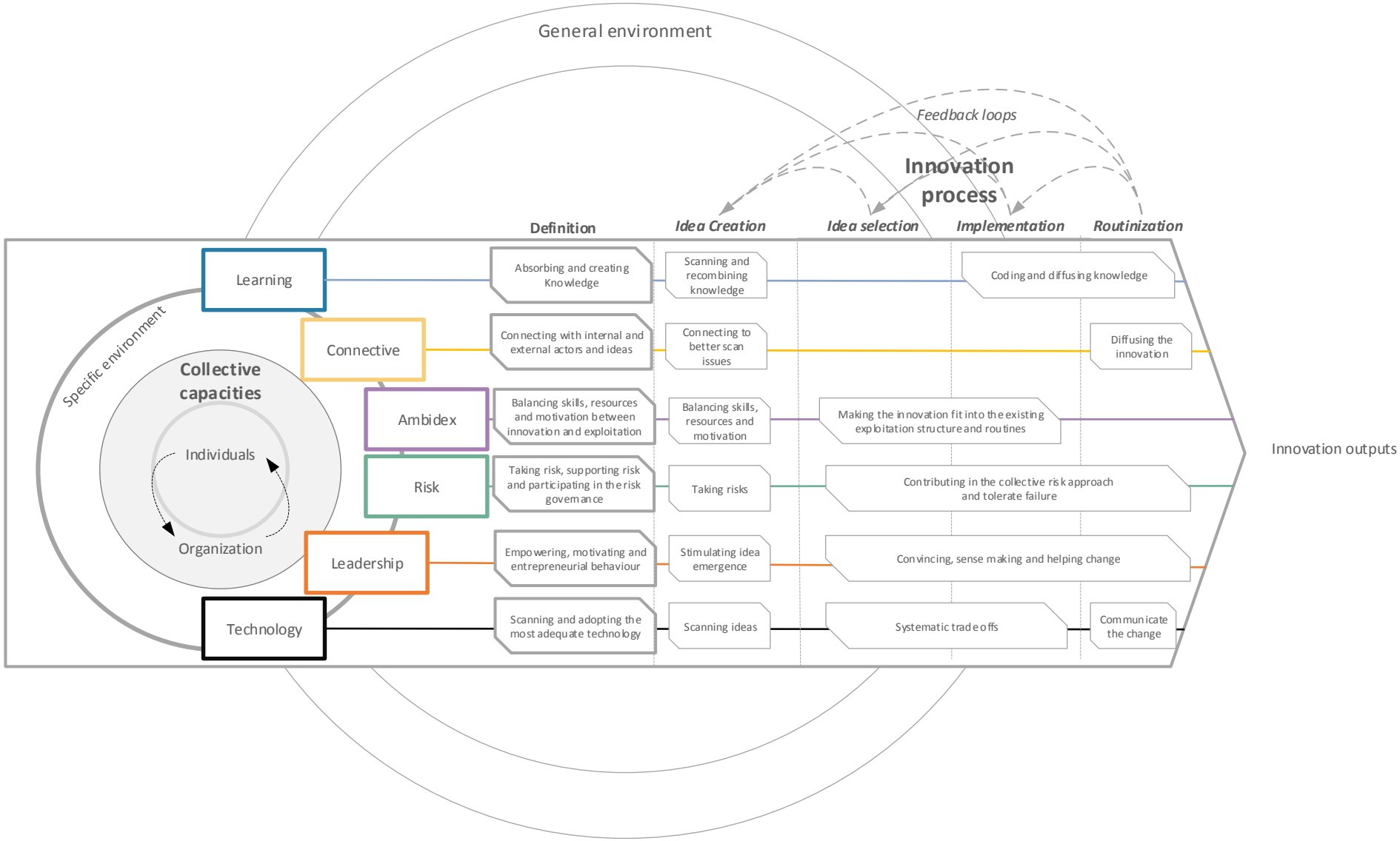
Propositions to Simplify the Framework

Following the experts' suggestions, it appears that for the six collective capacities, the content is differentiated according to the phase of the innovation process, although not systematically between all the phases. Therefore, we redesigned the refined framework to integrate potential phase specificities, assuming that the core idea of each dimension is still constant as a foundation, while some specificities can vary with the advancement phase.

The Refined Framework of IC in PSO

The refined framework of IC is described in Table 3 (see above) and is illustrated in Figure 1.

Figure 1: Illustration of Framework for IC in PSOs



Conclusion

The present study offered a framework of IC for PSOs, using a two-step modelling strategy: first a systematic literature review, then an expert survey. IC was found to be composed of six dimensions: learning, connective, ambidextrous, risk monitoring, leadership for innovation and technology. According to our framework, IC relies on different modes of activation in different innovation phases (Eggers and Singh, 2009; Glor, 2005, Rogers, 2003).

This framework has significant theoretical and practical implications. An important theoretical contribution results from the nested identification of the six dimensions of IC in PSOs. This framework improves on some previous research which has already scanned some attributes of IC in PSOs (Gieske, van Buuren and Bekkers, 2016), and is the first to aim to be integrative by incorporating a wide literature review besides consulting with a pool of experts and incorporating time aspects, leading to a kind of systemic framework aimed at describing complex realities. Secondly, the temporal aspect of IC is particularly interesting. Our framework suggests that IC consists of collective capacities which can be differently activated according to the innovation process phase. Previous conceptualizations have rarely incorporated time aspects in IC. Moreover, our findings suggest that IC in the public sector has specificities in comparison to the private sector. Among these specificities, the experts' survey showed how important leadership is in IC for PSOs, including political actors' leadership. Although the NPM literature sets political leadership aside from the exploitation of PSO, experts concluded that the role of politicians is particularly important for IC in PSOs. Subsequently, one can ask: what is pro-innovative leadership in a PSOs? The study by Miao et al. (2018) conceptualizes how, in the public sector, leadership can lead to innovative work behaviour by stimulating PSM. Therefore, public employees should not be encouraged to innovate in the same way as their private sector counterparts. Our framework integrates this publicness. Other public sector specificities are apparent from the literature review and the survey, such as the prominence of openness and collaborativeness, individual motivation to innovate, and risk averse culture. This constitutes an important difference between private and public sectors' motivation to innovate, and therefore confirms the idea of a theoretical detachment between the two sectors on innovation, leading to an autonomous theory period (Karo and Kattel, 2016: 7).

Alongside with those theoretical contributions, our framework also has practical implications. We assume in this article that innovation failure in the public sector can result from imbalanced attention to these six dimensions. Therefore, our framework suggests that the management of IC implies practices related to this bundle of six collective capacities. Our literature review outlined some practices meant to activate each collective capacity. This suggests that public managers can develop and maintain innovation capacity by simultaneously supporting individuals' capacities for connection, learning, balancing between innovation and exploitation (ambidexterity), risk taking, leadership for innovation and technological capacity. Subsequently, this framework could be used as an IC diagnosis tool for PSOs, which would be a support for public innovators to identify know how developed is their organization's IC and therefore to identify its gaps. However, there is hardly any empirical evidence of the combined effect of all these practices on the bundle of six collective capacities of IC. Another interesting lesson for practice can be taken from the time dynamic. In fact, our framework suggests that management of IC is grounded in six specific collective capacities, of which some require a phase-specific application. Finally, our framework converges with the systemic approach by showing how IC interrelates with each level of a PSO.

Political and administrative managers must be concerned with the fact that every individual within these levels has a role to play in the innovation capacity of their PSO. Even an employee with a purely exploitative task can modestly contribute to the IC of its PSO.

This study also has limitations. Its main limitation concerns the expert survey technique. In addition to the expert bias (experts have their own representation of reality), our approach tends to increase the complexification of the framework, because each expert is likely to add new elements. As a result, there is a tension between more comprehensiveness and more accessibility. Subsequently, we had to make choices in selecting which remarks to incorporate and which not. Although we tried to be as transparent in these choices as possible, there could be a bias. Another limitation results from the limited number of experts surveyed. Extending this survey to a broader sample of experts worldwide, such as in not represented countries (USA, UK, developing countries, etc.), would have been an asset. Finally, the survey was open, and thus difficult to interpret quantitatively. We decided not to adopt a closed questions survey because of the wide amount of information the preliminary framework contained. A closed questions survey would have been too long to include all the elements of the framework.

Future research could empirically explore the propositions made in this article on the nature of IC, and of collective capacities. Even though the collective capacities which were found throughout our literature review have been submitted to an expert's panel, we presumably missed complementary collective capacities, or conversely, some capacities we included are not observed in practice. An empirical testing of the overall model would therefore be valuable. Furthermore, interactions between levels and between collective capacities need to be empirically tested. Further studies could also explore what constituents of innovation leadership and technological capacity remain under-explored. Finally, organizational support of individuals' innovativeness could be studied further. More practically, the idea of using this framework as a concrete IC diagnosis tool for practitioners should be furthered, particularly by tackling the following question: are there high innovative work practices which fuel the combined development of the six collective capacities of IC for PSOs?

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Appendices

Appendix 1: Synthesis of the preliminary framework before the experts' survey

Collective capacity	What	How	When	Who
Learning	Collective capacity to accumulate tacit and explicit knowledge, and to be reflective on regular learning routines.	Absorbing, recombining, creating and experimenting with knowledge.	All along the innovation process, and particularly at the beginning (idea emergence requires knowledge) and at the end, to institutionalize new knowledge into routines.	Individual and collective levels.
Connective	Collective capacity to develop and maintain connections between internal actors and content, and between internal and external actors and content.	Coordinating, socializing, trusting, overcoming borders.	All along the innovation process.	Every internal and external actor.
Ambidexterity	Collective capacity to balance the antagonistic rationalities of innovation and exploitation systems, and to manage the resulting tensions.	Balancing flexibility and control or creating specialized structures, allocating resources to both systems.	All along the innovation process, particularly during the creation and implementation phases (both result in generating high tensions between innovation and exploitation).	Organizations, management and individuals—e.g. via strategies, structures, routines.
Risk management	Collective capacity to develop and maintain adapted soft and hard risk management routines and culture.	Collecting information, involving actors, encouraging risk taking, communicating and creating safe spaces.	All along the innovation process, particularly during the idea selection (when the risk governance should be set and incertitude is great) and during the institutionalization (when risk aversion is one of the main barriers).	Mainly organization and supervisors for hard risk management, each actor for soft risk management.

Appendix 2: List of the main nodes after coding the experts' suggestions

Nodes	Sources	Ref	Examples of quote
Phase – timing - process	10	23	
Add precision in the first phase	6	16	"There are problem if ideas are only to emerge passively: better to allow for active idea generation as well."
Remove or justify the diffusion phase (4)	3	9	"In the same way, you choose a diffusionist logic and I don't understand why."
Add an idea testing phase	1	1	"Idea testing before idea selection is missing (early stage)."
Modify the sequential form	3	3	"I understand that you want to use a phases model—and you do say that in reality it is nowhere near so neat, but I guess like all these models it does give the impression that things are much more simple than is the case in reality!"
Distinguish phases 1 and 2 more	1	1	"Idea emergence and selection could be little more distinguished."
Add evaluation and feedback loops	1	2	"Evaluation should be occurring during each phase of the model. Connecting to literature on double loop learning."
Sub-capacities	12	34	
Precise learning cap	6	14	"How much of the model accounts for general literature on learning organizations?"
Precise connectiveness	3	3	"Somewhere one needs to specify the counterpart (Other organizations? Individual?)"
Precise ambidexterity	9	14	"Isn't the ambidexterity level higher than learning, connective and risk capacities—i.e. ambidextrous structures, organization's need to learn, connect and govern risks?"
Precise risk cap	7	15	"To what extent is this a capacity/capability, rather than a mind-set or a pre-requisite in the organizational culture for innovative projects?"
Levels	4	6	
Define the role of external network more	5	9	"The category "external network" is not fully clear. Who are the 'doers' in this section? Whose capacity is being evaluated?"
Define precisely how organizations interact with other levels	5	7	"I was wondering if the idea of 'slack money' and budget cuts is discussed here?"
Precision in the role of individuals	3	4	"I wondered if innovative work behaviour is [included]? If not, this might be interesting."
Add the political level	1	1	"I question myself on the way your framework considers the political decision process which also impacts the implementation of innovation capacity of PSOs"

Nodes	**Sources**	**Ref**	**Examples of quote**
References to integration	12	26	"I hate authors who push their own papers, [but] I co-wrote a paper on this issue: (ref)"
General propositions	13	29	
Define innovation more	3	3	"What counts as innovation?"
Anticipate empirical issues	5	6	"Methodology: are you going to apply the framework for the empirical research? If so, I think you should think carefully about: […]"
Integrate leadership	3	4	"More specifically, I was surprised by the fact leadership is only linked to risk governance capacity?!"
Integrate technological and technical aspects	3	3	"Technological challenges are not mentioned, yet this is a key issue in the public sector right now and weaves through every other area."
Make it simpler	5	5	"Overly complex to follow and see empirical and practical implications."
Define capacities more	4	5	"I would recommend that you clarify your concept of innovation capacities as compared to or influenced by that of dynamic capabilities."

Appendix 3: Synthesis of the innovation phases of the preliminary framework

Phase	What	How	Main Challenges	Who
Idea emergence	Identifying problems and opportunities, and generating ideas based on organizational goals and culture.	Environment scanning, user empathizing, risk anticipating.	Lack of knowledge, closed culture to new ideas, lack of incentives, lack of idealism.	Every actor, particularly front-line bureaucrats.
Idea selection	Selecting ideas that will be pursued.	Techniques of ideas' translation into potential projects.	High degree of uncertainty, lack of negotiation, compromise, resources and pragmatism.	Every actor, particularly teams (e.g. working groups/managers).
Implemen-tation	Implementing the selected ideas, changing routines.	Refining, prototyping, testing, pilot projects, financing.	Resistance to change, lack of evidence, transparency and sense making.	Every actor, particularly leaders (administrative and political leaders).
Diffusion and re-adjustment	Diffusing the innovation to other organizational or network actors, and readjusting.	Connections between potential adopters and the actors of innovation.	Risk aversion, lack of success in the previous phase, lack of collaborativeness.	Every actor, but mainly networks central actors.