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Come Together, Right Now

Empirical studies on collaborative public sector innovation

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Te verdedigen door

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Preface/Voorwoord

De snelheid van de ontwikkeling, implementatie en verspreiding van innovaties is fascinerend. OpenAI, het bedrijf achter ChatGPT en DALL-E, werd opgericht rond de tijd dat ik solliciteerde voor dit doctoraatstraject. Inmiddels onderzoekt de Nederlandse Rijksoverheid of ze het gebruik van kunstmatige intelligentie (AI)-software, zoals ChatGPT, door ambtenaren moet verbieden. Al helemaal ondenkbaar aan het begin van mijn doctoraatstraject was dat ik de omslag van dit proefschrift zelf via kunstmatige intelligentie kon laten genereren, simpelweg door het commando *'public sector innovation through collaboration in Belgium, in the style of pop art'* in DALL-E in te voeren. Gezien het onderwerp van dit proefschrift leek me een AI-gegenereerde omslag wel op zijn plaats.

Toen ik begon aan mijn doctoraatstraject wist ik dat het uitdagend zou worden. Nu terugkijkend op de afgelopen jaren kan ik met zekerheid zeggen dat het dat ook daadwerkelijk is geweest. Toch kijk ik met een positief gevoel terug op de afgelopen jaren. Door het schrijven van dit proefschrift heb ik de kans gekregen om me te verdiepen in samenwerkingsverbanden die als doel hebben om een innovatie in de publieke sector te bewerkstelligen. Daardoor heb ik veel interessante plekken binnen het Belgische openbaar bestuur mogen zien en kunnen bestuderen. Nu ik inmiddels zelf voor de Nederlandse Rijksoverheid werk, zie ik de noodzaak van gedegen kennis over innovatie door samenwerking en ben ik blij dat ik mijn opgedane kennis in de praktijk kan brengen.

Het schrijven van dit proefschrift en daarmee het kunnen opdoen van kennis over dit thema zou nooit mogelijk zijn geweest zonder een aantal mensen die ik graag hier wil bedanken. Allereerst wil ik prof. dr. Koen Verhoest bedanken voor het mogelijk maken van dit doctoraatstraject en zijn begeleiding. Door jou ben ik een veel betere onderzoeker en schrijver geworden en zijn deuren open gegaan die anders gesloten zouden blijven. In het bijzonder kijk ik met warme gevoelens terug op het vak dat we samen gaven en waar ik ontzettend veel plezier aan heb beleefd. Dank voor het vertrouwen in mijn onderzoekende en onderwijskundige kwaliteiten.

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niet te perfectionistisch moet zijn, maar de papers gewoon moest insturen hebben me ontzettend geholpen. Ook bedank ik prof. dr. Lise H. Rykkja en prof. dr. Wouter van Dooren voor het zitting nemen in mijn jury.

Dit proefschrift komt voort uit het interuniversitaire onderzoeksproject 'Public Sector Innovation through Collaboration (PSI-CO)'. Voor dit onderzoeksproject heb ik veel moeten samenwerken met de KU Leuven, l'Université Catholique de Louvain en l'Université de Liège; onder meer voor de dataverzameling van enkele studies. Daarom bedank ik Charlotte, Paulien, Cécile, Aline, Trui, Stéphane, David en Catherine. De samenwerking heeft me niet alleen meer inzicht gegeven in innovaties in de publieke sector, maar ook in de wondere praktijk van het samenwerken binnen een Belgische context.

Gedurende mijn tijd in Antwerpen heb ik het genoegen gehad om te werken met hele fijne collega's. In het bijzonder bedank ik Emmanuel en Chesney, twee fantastische onderzoekers die op hetzelfde onderwerp werken en daarnaast buitengewoon prettige mensen zijn, en Bjorn, met wie ik jaren een kantoor deelde en ik diepe gesprekken had over zowel wetenschappelijk onderzoek als baslijnen en Pokémon.

Gelukkig kon ik altijd rekenen op de steun van vrienden en familie. Vidar, door jou ben ik in Antwerpen terecht gekomen. Niet alleen was jij altijd een heel fijn klankbord, maar ik kon altijd mijn hart bij jou luchten. Ik ben blij dat jij mij nu mijn doctorstitel ziet behalen. Ik waardeer onze vriendschap enorm. Steven, Balderick en Gordon, als ik ooit behoefte had om mijn zinnen te verzetten kon (en kan) ik bij jullie terecht. Of het nu op café (lekker drinken) of via de telefoon is , we weten ons altijd kostelijk te vermaken. Op naar nog meer avonden gezelligheid en buitenlandse tripjes! Aad, stop nooit met het voorstellen van de meest vreemde bands om te zien. Hopelijk kunnen we nog vaak genoeg naar bands die onze kinderen als dad rock zullen omschrijven en zich voor zullen schamen. Leroy, Michael en Daniëlle, toen ik aan dit traject begon woonden we nog allemaal in de Caland. Inmiddels hebben we allemaal een totaal ander leven, maar ik ben blij dat we elkaar nog regelmatig zien. Adwin, mijn oudste vriend, op naar nog twee keer dertig jaar vriendschap! Esther en Erwin, helaas heb ik door dit avontuur veel gezamenlijke etentjes moeten missen. Laten we dat inhalen met Felix erbij. Ma, de afgelopen jaren heb ik veel steun gehad van jou. Zeker toen ik in Antwerpen woonde voelden de weekenden dat ik bij jou kon blijven slapen echt als een mini-vakantie. Mede door jou heb ik deze mijlpaal weten te bereiken.

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Chapter 1

Introduction

1.1 The significance of studying collaborative innovation in the public sector

Innovation is a concept that has captured people's imagination for decades as a way of solving problems in a drastic way and breaking the status quo. Whereas classic scholars such as Schumpeter (1942) pioneered in the early 21st century with the study of innovation focusing primarily on the private sector, innovation in the public sector is now increasingly an object of interest as well (Hartley, 2005; Osborne & Brown, 2011; Arundel et al., 2019; Torfing, 2019). Various developments have caused a growing demand for innovation in the public sector, such as rising expectations about the quality, availability, and effectiveness of public services, and the growing demands for governments to be responsive (Sørensen & Torfing, 2012). Innovation is regarded important for governments to be able to provide good services to citizens and society and to solve challenging problems in an increasingly complex society (Arundel et al., 2019).

In today's society, it has become increasingly difficult for governments to solve societal problems with standard solutions as a growing number of public policy tasks involve problems that cannot be solved with more money, standard solutions or within the own bureaucratic organization (Bommert, 2010; Wegrich, 2019; Torfing, 2019). In addition, governments are faced with some difficult questions, such as which capacities their organization must develop in order to be able to innovate (Gieske et al., 2019). Moreover, the question also rises whether public sector innovations are best developed by individual 'innovation heroes', whether the development is mainly an 'in-house' activity or if innovations are best developed in active collaboration with others outside the own organization?

In recent years, scientific literature has increasingly focused on the latter option (Ansell & Torfing, 2014; Stevens & Verhoest, 2016; Bekkers & Tummers, 2018; Torfing, 2019; Callens et al., 2021; Dockx et al., 2022). Collaboration for innovation is regarded necessary because governments need to deal with wicked problems that exceed organizational boundaries and policy sectors. In these wicked problems, there is not only a lack of knowledge or consensus on the solution of the

problem, but the extent and nature of the problem itself is unknown as well (Rittel & Webber, 1973; Head, 2019). Think, for example, of the COVID-19 crisis or problems regarding climate change. These problems require innovative solutions that simply cannot be developed entirely by one single organization. They should be 'innovative solutions' because standard solutions are most likely not effective and are 'in collaboration' because a single organization does not have all the necessary knowledge and resources to develop an effective solution that provides a solution to the entire problem and that can count on sufficient support of all relevant stakeholders.

Developments like these result in governmental organizations increasingly working together with each other and with external actors to develop innovative solutions. Hence, innovation through collaboration has been used by governments as strategy to optimize the availability of resources (Diamond & Vangen, 2017; Lewis et al., 2018; Voets & De Rynck, 2008), the management of crises (Elston et al., 2018), to increase the innovativeness of public services (Mergel & Desouza, 2013) and as response to societal and technological developments (Seo et al., 2018; Sørensen & Torfing, 2012).

Public sector innovation is therefore oftentimes no longer simply a matter of a single government organization developing the innovation in its entirety. Innovation has increasingly become a matter of collaboration between multiple government bodies across multiple administrative layers and policy areas, private parties, knowledge institutions, citizens, non-profit organizations and so on (Nooteboom, 2007; Vangen, 2017). Not only has the governmental apparatus and society itself become more fragmented, and are different actors increasingly interdependent on each other, but new communication technologies also make it easier to collaborate with multiple actors (Castells, 2000; Geuijen et al., 2017). It is nowadays easier to involve previously unheard groups in the innovation process and, contrary, they can and will also more easily make their voices heard if they are not involved (Agger and Lund, 2018; Go Jefferies et al., 2021). These collaborations can create a richness of different perceptions and means of production from which one can learn, combine and assemble innovative ideas (Nooteboom et al., 2007; Vangen 2017). Collaboration enables government organizations to better understand the problem and to mobilize a variety of resources to realize the innovative solution. However, such collaborative innovation processes only succeed if the collaborative process is for example well designed, includes the right actors and is properly coordinated (Sørensen & Torfing, 2009; Gjaltema et al.,

2020), if the participating organizations have an innovation-oriented culture (Büschgens et al., 2013), and if the individuals and their home organizations possess the right skills to optimally collaborate for innovation (Gieske et al., 2019). Moreover, interaction between different actors in the collaborative arrangement should be effective and efficient to come to successful outcomes (Provan & Sebastian, 1998; Cristofoli & Markovic, 2016). Working together for innovation should, however, not be regarded as the ultimate solution for achieving public sector innovation. Collaboration is also associated with problems, such as increasing complexity and misunderstandings between actors, that are to a lesser extent present when an innovation is developed within a single organization (Siddiki et al., 2017; Varda & Retrum 2015; Cinar et al., 2019). Thus, collaboration is anything but a guarantee for successful innovation public sector innovation (McGuire & Agranoff, 2011; Wegrich, 2019, Meijer & Thaens, 2021).

This shows that collaborative public sector innovation consist of a wide array of aspects in order to be successful, but research on collaborative public sector innovation has only really taken off in the last two decades. This dissertation adds to the existing literature by answering a research question that combines two crucial pillars of collaborative innovation: the composition of the collaborative arrangement and its network structure regarding interaction for exchanging information. Furthermore, special attention is paid to the coordination of the collaborative arrangement in both the composition of the collaborative arrangements as its structure.

By zooming in on these pillars, it is possible to examine to what extent collaboration is an effective way for the development of innovations, what the composition of these collaborative (should) look like, how these actors in the collaborative arrangement then (best) interact with each other and how these interactions are best managed.

Hence, this dissertation answers the following main research question:

How do the composition and interaction structures of collaborative arrangements aimed at public sector innovation lead to innovation?

This question is answered by examining four sub questions that correspond to the four empirical studies in this dissertation.

1. **To what extent do organizational capacities for innovation and diversity in collaborative arrangements aimed at innovation lead to different types of innovation?**

As governments are increasingly forced to innovate, governmental organizations must develop capacities to be able to innovate, such as being able to learn and having sufficient resources to innovate (Gieske et al., 2019; Gilsing & Duysters, 2008). Moreover, they collaborate increasingly with a diverse array of external actors. At first glance, diversity of the collaborative arrangement seems a clear advantage compared to an collaborative arrangement that consists of sort-like actors with the same worldview (Lewis et al., 2018). However, commonly associated disadvantages of diversity in collaborations are misunderstandings between actors, a lack of common ground towards the innovation and the increase of the overall complexity surrounding the problem at hand (Siddiki et al., 2017; Varda & Retrum, 2015; Cinar et al., 2019). Thus, developing public sector innovations through collaboration is inherently linked to the tension between the advantages and disadvantages of diversity of the collaborative arrangement and thus; whether diversity is beneficial for the innovation process.

In this study it is examined what organizational capacities and diversity of the types of actors actually contribute to the development of policy, technological, service, and process innovations. To date, little distinction has been made between different types of innovations, while public sector innovation is anything but an unambiguous concept. The sub question is answered using a quantitative analysis performed on data gathered among civil servants working at the two highest levels of the Belgian federal administration and the Flemish administration.

2. **How do coordinators compose collaborative arrangements aimed at innovation for the promotion of synergy concerning idea generation and implementation?**

One of the main reasons to collaborate for public sector innovation is to create a process in which resources complement each other and to come to a synergetic process (Cramm, et al., 2012; Ansell & Torfing, 2014). To the end of promoting synergy, arranging a collaborative arrangement with the inclusion of the necessary actors and their resources is essential at different stages of the innovation process (Voets & De Rynck, 2008; Corbin & Mittelmark, 2008; Diamond & Vangen, 2017; Lewis, et al., 2018; Loban et al., 2021). In this second study, eight collaborative innovation projects are examined to see how actors are brought together with the goal to establish synergy. Data comes from 91 semi-structured interviews from

eight different Belgian case studies where actors formed a collaborative arrangement to develop and/or implement a public sector innovation.

3. **How can innovative outcomes of collaborative public sector innovation projects be explained by the network integration of its most important actors?**

Whereas sub question 2 examines the way collaborative arrangements are composed, sub question 3 examines how actors are integrated in the collaborative arrangement and how they interact with each other. Special attention is paid to the importance of actors in relation to the process and the way information is shared. One of main arguments in favor of collaborative innovation is that interaction with each other helps to generate new ideas and that different insights, and resources an actor can bring to the table are connected (Bommert, 2010; Torfing, 2019). In this regard some actors are found to be more important than others in collaborative processes (Scharpf, 1978; Koppenjan & Klijn, 2004: 147). For example because these actors have more valuable resources, more power, or are the coordinator of the process. This study examines to what extent the structure and the interactions of collaborative arrangements in relation to the importance of actors are related to successful innovative outcomes. Social network data of three collaborative arrangements aimed at developing a public sector innovation is used to answer this question using a hierarchical clustering of cliques analysis.

4. **To what extent do the actors' home organization influence the interactions in collaborative arrangements aimed at innovation?**

After examining whether collaboration with a diverse set of actors is beneficial to innovation, how the collaborative arrangements are composed, the network structure looks like and how the integration of the network is associated with innovation, the question then rises what explains interaction in the networks. As previously mentioned, public sector innovation is a response of government bureaucracies being less capable to solve just within their own bureaucratic organization (Hartley et al., 2013; Lewis et al., 2018). Increasing resource dependencies between the different actors who are involved in the policy issue require a new approach to innovation in order to solve the wicked problems. As a result collaborative arrangements aimed at innovation are created in which actors are involved who act on behalf of their home organization. By answering this last sub question, the way the home organization influences interaction in collaborative arrangements aimed at innovation is examined. Exponential random graph models

(ERGMs), are executed to determine what drives interactions in the collaborative arrangements.

As argued, this thesis' main focus is on two main themes of the collaborative innovation process: the composition of the collaborative arrangement and the interactions within these collaborative arrangements. This is visualized in figure 1. The first two research questions relate to this first theme. They focus on the diversity of the collaborative arrangement, how it leads to public sector innovation, and how these collaborative arrangements are (best) arranged. Whereas research question one and two center on the characteristics of the actors, research questions three and four center on the interactions among the actors: After being brought together in a collaborative arrangement, how do actors interact and why do they do so?

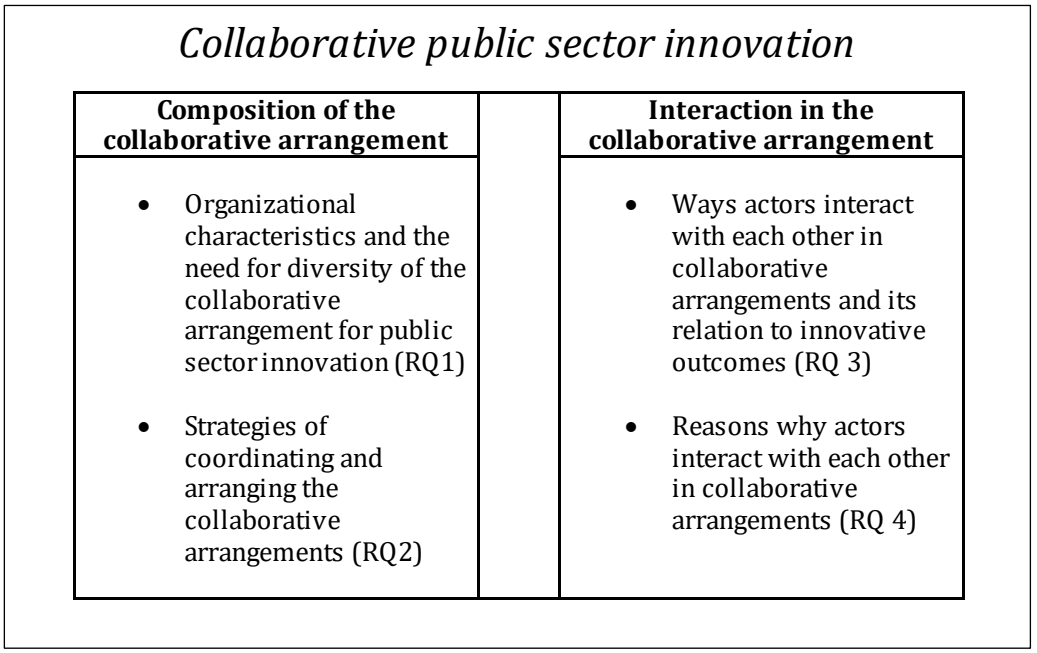

Figure 1. Conceptual framework

1.2 Contribution of this dissertation

This dissertation has both a theoretical and practical relevance. Each chapter contains a more elaborate reflection on the relevance of the study in question then is presented in this introductory chapter. Moreover, a reflection on the added value

of this thesis in relation to the various studied concepts is added in the concluding chapter.

1.2.1 Theoretical contribution

The literature on innovation in the public sector has been growing in recent years. However, there are still plenty of gaps in the current state of the scientific literature. This thesis has two main angles to look at innovation through collaboration.

Firstly, this dissertation looks at the composition and coordination of innovation projects. The study of coordination of governance networks is not new. Ever since the 1990s, studies on how collaborations are best managed has produced a rich body of literature (e.g. Kickert et al., 1997; Gjaltema et al., 2020). However, this body of literature does not only focus on collaborative arrangements aimed at innovation. The difference between 'normal' governance networks and networks aimed at innovation lies in the fact that innovation is characterized by uncertainty. Actors enter a process in which it is (often) unclear what the outcome of the collaboration will be, whether it will actually be successful and what is expected of them in terms of making resources available. Collaborative innovation requires actors to invest resources in a process of which it is not certain whether it will have a successful outcome. Innovation represents a clear break from how things were done before and therefore includes much more uncertainty than the collaborating to optimize existing services, routines, policies and so on (Damanpour et al., 2009; De Vries et al., 2016).

More recently, research has been conducted into the coordination of innovation projects (e.g. Agger & Sørensen, 2018; Stevens & Verhoest, 2016). However, findings are contradictory and are often based on one or a few case studies. In this study, the metagovernance strategies in eight different cases were examined on the basis of 91 interviews. In addition, this is one of the first studies to specifically look at the coordination of the collaborative arrangement in relation to one of the main generative mechanisms of innovation: the creation of synergy (Ansell & Torfing, 2014; Loban et al., 2021).

Concerning the composition of the collaborative arrangement, innovation through collaboration is often seen as the best way to solving social problems. But although the literature is oftentimes positive about innovation through collaboration, collaboration is oftentimes not the most logical step to take (Wegrich, 2019). Although collaboration can lead to a more nuanced view of the problem and more

resources can be gathered (Bommert, 2010; Lewis et al., 2018), collaboration with multiple partners also increases the risk of misunderstandings among the partners (Siddiki et al., 2017; Varda & Retrum 2015; Cinar et al., 2019). The question then rises when collaboration is desirable and if so, with which diversity of actors. This dissertation examines to what extent collaboration with a diverse set of actors is necessary for the development of different types of innovation. Research on public sector innovation is often focused on a specific type of innovation (such as service innovation) which is examined in a single or multiple case study without making a systematic comparison between different types of innovation (e.g. Agger & Lund, 2019). In other instances, public sector innovation is treated as an unambiguous concept and authors make no distinction between the different types of innovation in their study (e.g. Gieske et al., 2019). This dissertation uses a large-scale survey to draw conclusions on how diversity of the collaborative arrangement leads to the development of different types of innovation. In doing so, it is the first to make a distinction between different types of public sector innovation.

Secondly, the dissertation provides new insights in the way actors within a collaborative arrangement interact with each other and links this with innovative outcomes. Recently, considerable research has been devoted to the relation between network structure and network effectiveness (e.g. Raab, et al., 2015; Cepiku et al., 2020; Stevens, 2018). Clique overlap is named as the most effective type of network integration by milestone studies such as those by Provan and Milward (1995) and Provan and Sebastian (1998). Cliques are a minimum of three different actors who are directly connected to each other in an interaction network. When actors are a member of multiple cliques it results in clique overlap. Although clique overlap is named as effective way of network integration for positive network outcomes, so far no study has examined clique overlap in innovation networks in relation to the position of the most important actors of the network. This is remarkable as the premise of collaborative innovation is to include actors in the innovation process because they bring resources to the process. Some actors are therefore found to be more important than others to be included in the innovation process (Scharpf, 1978; Pfeffer & Salancik, 1978; Koppenjan & Klijn, 2004; Hillman et al., 2009). This dissertation is the first to examine how these important actors are integrated in the network through clique overlap and how the integration is related to innovative outcomes.

Moreover, it is examined in this dissertation what drives the interactions in these collaborative arrangements aimed at innovation, with a special focus on the

representative's home organization. As mentioned, innovation through collaboration has been increasingly adopted to tackle complex social issues. As a result, the development of public sector innovations is to a lesser degree an 'in-house' matter and the innovations are increasingly more developed in collaborative arrangements that force organizations to interact across organizational borders (Bommert, 2010; Wegrich, 2019; Torfing, 2019). Despite the growing body of literature on collaborative public sector innovation, little is known about the influence of the home organization on the interactions of the representatives acting on behalf of the organization in the collaborative innovation arrangement. In this dissertation, it is examined to what extent the home organization influences the eagerness of the representatives to share information in such arrangements for collaborative innovation.

1.2.2 Practical contribution

This study examines various aspects of innovation through collaboration. As mentioned, governments are increasingly forced to innovate through collaboration. Although the study of this topic is receiving more and more attention, it is often still unclear to civil servants how this collaboration should best be approached in order to achieve successful innovation. This study focuses on two different aspects. Firstly, this study offers insights into the composition of collaborative arrangements and the best way to manage them. This makes the results highly relevant for persons who have to compose or lead such collaborative arrangements. The study examines how bringing together various actors can lead to successful innovation. It makes recommendations on the strategies to be followed, the positioning of key actors in the interaction networks, the inclusion of which actors for what types of innovation projects, and so on.

Secondly, this thesis also examines the underlying home organization in collaborative innovation processes. As such, this dissertation also offers insights for civil servants working in an organization engaged in collaborative innovation, but who are not necessarily the coordinator, or even not actively involved in the collaborative arrangement itself. The study examines how the organization can improve development and implementation of public sector innovations, such as the processes and culture that should be in place within the own organization to maximize the benefits of the collaborative innovation process. It examines how organizational characteristic influence interactions and thus how organizations could transform themselves in becoming an organization that optimally supports the development and implementation of public sector innovation.

By examining these aspects it is possible to increase the benefits of collaboration and to reduce its disadvantages.

1.3 Context and data

This dissertation's focus is on Belgium. The federal state of Belgium is a country in Western Europe with a population of approximately 11.5 million inhabitants. The institutional organization of the country is fairly complex and is structured on the three different highly autonomous regions which are based on geographic and linguistic grounds. Simply said, Belgium consists of the Dutch speaking Flanders region in the north, the predominantly French speaking Walloon region in the south and the bilingual Brussels-Capital region. These regions have to a high extent legislative and executive power as well as an own parliament, but are also subjected to the higher federal level of government.

As of 2022, Belgium ranks 26th on the Global Innovation Index (GII) (Dutta et al., 2022:50) and is regarded an 'innovation leader' according to the 2022 European Innovation Scoreboard issued by the European Commission (Directorate-General for Research and Innovation, 2022:7). This makes the Belgian context an interesting one to study because despite the complexity of its institutional organization, Belgium is able to be a highly innovative country.

The research questions in this dissertation are answered using multiple data collection methods. It combines qualitative and quantitative data analysis methods in line with what is advocated by pioneering researchers on collaborative public sector innovation (Sørensen & Torfing, 2011: 862-863). Data was collected in the context of the Public Sector Innovation through Collaboration (PSI-CO) project. This project is part of the Belgian Federal Brain.be research program [1].

Chapter 2 is written based on data of a large scale survey about (collaborative) innovation in the federal and Flemish government organizations. The highest managerial levels of federal and Flemish government organizations were invited to participate in this study. With this data it was possible to examine how organizational characteristics and collaboration with certain actors leads to the development of different types of innovation. In total 445 respondents filled out the

[1] The research behind the results was funded by the Federal Science Policy Office under the contract no. BR/154/A4/PSI-CO.

survey, which forms a good representation of the highest managerial levels of the federal Belgian and Flemish administration.

Furthermore, data of case studies are used in chapters 3, 4, and 5 of this dissertation. A total of eight case studies were conducted, using a range of data collection techniques like document analysis, network mapping (analyzing actors and their resources), social network questionnaires to map actors and relations, individual questionnaires, and semi-structured interviews. Data collection and reporting of these case studies was standardized across the case studies. The cases consisted each of an arrangement of different actors that frequently came together to discuss the process. The aim was to interview every actor in these arrangements in order to get to know everyone's perspective on the innovative case. These interviews were complemented with an online survey which would be filled out by the same respondents. Thus, each respondent was invited to give an interview and fill out a survey on their experience with a specific innovation. These included questions about their experience on the process, the outcomes, what they learned, the applied strategies and the characteristics of their home-organization. The survey also provided quantitative data on the network structure. In total 84 interviews were conducted and 110 surveys completed.

The case studies were selected based on various criteria for inclusion and variation: (1) the cases entail arrangements involving public actors, and to the extent possible, also private actors and citizens; (2) all cases being situated in Belgium and initiated by the federal government or at least with the inclusion of a federal actor, and to the extent possible also other levels of government; (3) to avoid the pro-innovation bias, we also included cases that did not materialize in innovations, or in which innovation processes were particularly difficult to manage; (4) other important criteria included comparability, originality, and accessibility.

1.4 Main concepts in this dissertation

Some concepts are frequently used in this dissertation. These are clarified here. A more detailed, theoretical basis for these concepts can be found in the various theoretical frameworks of the different chapters.

1.4.1 Public sector innovation

Innovation is a concept that fires the imagination. When thinking of innovation we often think of major technological changes that are usually associated with the private sector. For example, the introduction of the Apple iPhone, which unleashed

a revolution in the smartphone market. Although this is a very good example of an innovation, innovation in this study differs in two important respects.

First, this study focuses on innovation in the public sector and not on innovation initiated by the private sector. An important difference is that private innovation focuses on innovation to gain a market advantage (Mazzucato, 2013). In the case of the iPhone example, Apple develops the iPhone in order to enter the global smart phone market and to get ahead of the competition with a revolutionary product. Consequently it tries to retain a market share as large possible and to maximize profit. This is different for innovation in the public sector. In the public sector, there is no (or at least less) competition from other organizations. For example, a municipality does not innovate to compete with a neighboring municipality.

Instead, the public sector innovates to create public value (Crosby et al., 2017). Think of solving a societal problem or offering a better service for citizens and in that way offering value to society. This is the other difference with innovation from the iPhone example. Although the public sector can certainly develop major revolutionary technological innovations, such as the World Wide Web, in this dissertation innovation should often be seen on a smaller scale and certainly does not always have to be technological in nature.

This study uses the literature review by De Vries et al. (2016) as a starting point for defining public sector innovation. This literature review examined 181 scientific articles and examined how innovation is defined in these studies. Despite the fact that no unambiguous definition is present, two different elements generally emerge in definitions. These elements are also taken as a starting point in this dissertation. Firstly, the innovation is new in a given context. This does not mean that the innovation does not already exist somewhere else. An innovation can perfectly well already exist somewhere else, but it can still be considered highly innovative in a new context. An example is the provision of digital tools to improve service delivery. These digital tools can be copied from another country or another municipality, but by implementing them in the new context, they can create a drastically new, innovative way of working in that specific context.

In addition, definitions emphasize that innovations must also be perceived as new by those involved. If something is developed that is in line with what is already being done, it can hardly be called an innovation. Thus, innovation must be something new compared to how things were done before. As already mentioned,

governments are forced to innovate because in today's complex society it is increasingly difficult to fall back on standard solutions. Therefore, this dissertation is in line with the prevailing idea of innovation being a 'break with the past' and not merely an incremental adaptation of an existing process. In that latter case it is better to speak of 'optimization' (Damanpour et al., 2009; Osborne & Brown, 2011). With regard to innovation, this dissertation often mentions the 'innovation process'. Innovation is a process of several phases that more or less succeed each other. For this study, the generally accepted classification is used which consists of: 1) idea generation, 2) idea selection, 3) implementation (including pilot testing), 4) dissemination (Sørensen, 2012).

1.4.2 Collaboration

The focus of this dissertation is on how innovation comes about through collaboration. It can be argued that innovation always requires some form of collaboration. After all, it is virtually impossible for the process of idea generation, idea selection, implementation and dissemination to be done by a single innovation hero working in one single organization. There are simply too many dependencies in the innovation process. For that reason, this study uses a more specific conceptualization of collaboration that ties is with the meaning of collaboration by Keast et al. (2007) who emphasize high intensity among actors and excludes (one-off) short-term one-on-one collaborations with, for example, a hired external consultant. This is therefore not a type of collaboration this dissertation focuses on. Collaboration in this dissertation refers to a mutual commitment of multiple actors (governmental or non-governmental) to work together over a certain period of time towards a common end goal that can only be reached through the exchange of materials or resources, ideas and/or social relations.

Two elements are important in this respect. First, the collaboration should surpass the organizational borders, for example collaboration with government organizations at another policy level or policy area, private companies, citizens, knowledge institutions and so on. A second element is that the collaboration should have a certain durability. In other words, it must be a collaborative arrangement made up of a number of actors who meet regularly to develop the innovation. The group of actors collaborating with each other are oftentimes referred to in this dissertation as a 'collaborative arrangement (aimed at innovation)'.

1.4.3 (Network) coordinator / metagovernor

The management of these collaborative arrangements is done by what we call in this dissertation a (network) coordinator. This activity is also sometimes referred to as 'metagovernance' (the governance of governance networks) and can be defined as *'a practice by (mainly) public authorities that entails the coordination of one or more governance modes by using different instruments, methods, and strategies to overcome governance failures.'* (Gjaltema et al., 2020).

Metagovernance consists of different levels of involvement. A commonly used classification is the hands-off and hands-on dimension (e.g. Sørensen, 2014). The hands-off approach is when coordination is performed at a distance which allows the actors in the network to self-govern the network within the policy and resource frame. Hands-off coordination can also be applied through the strategic design of the institutional set up where the actors operate in (Koppenjan & Klijn, 2004:212; Agger and Sørensen, 2018). In contrast, hands-on metagovernance involves the day-to-day, hands-on management with active participation of a coordinator. This is the coordination exercised with direct interaction with the collaborative arrangement through 'facilitation' or direct 'participation' Facilitation is characterized by the careful facilitation of collaborative processes within the network that is able to enhance trust or understanding among actors and to cope with conflicts or trouble in the negotiation process. The coordinator does not necessarily intervene strongly with the activities in the network, but rather facilitates the means to enhance the collaborative process. In addition, stronger intervention happens when the coordinator actively participates in the governance network and which allows the coordinator to influence the negotiation processes in the network.

This dissertation centers on coordination/metagovernance in which the coordinator is directly involved in the interactions in the collaboration and is responsible for the coordination of the 'day-to-day' management. We therefore exclude coordination that is largely hands-off. This includes, for example, coordinating by only providing financial support to the collaborative arrangement without being actively involved in the activities within the collaborative arrangement. For that reason, we refer to the management of the collaborative arrangement as 'coordination'. The actor or actors coordinating the collaborative arrangement are consequently referred to as the (network) coordinator.

1.5 Structure of this dissertation

Chapter	Title	Research question	Method	Authors	Status[2]
1.	Introduction			Tom Langbroek	Not applicable
2.	The effect of organizational capacities and collaborative diversity on different types of public sector innovation	To what extent do organizational capacities for innovation and diversity in collaborative arrangements aimed at innovation lead to different types of innovation?	Tobit regression	Tom Langbroek, Koen Verhoest and Emmanuel Dockx	Submitted to a well-known international journal
3.	Setting up the collaborative arrangement for the establishment of synergy	How do coordinators compose collaborative arrangements aimed at innovation for the promotion of synergy concerning idea generation and implementation?	Qualitative study	Tom Langbroek	Published in *The Innovation Journal: The Public Sector Innovation Journal*
4.	Network structure, actor importance and its relation with innovative outcomes	How can innovative outcomes of collaborative public sector innovation projects be explained by the network integration of its most important actors?	(Hierarchical clustering of) cliques analysis	Tom Langbroek and Koen Verhoest	Accepted for publication as book chapter in *Collaborating for Digital Transformation* issued by Edward Elgar Publishing

[2] Furthermore, I was a co-author during my tenure as PhD student for the following published peer reviewed journal articles which are not included in this dissertation:

- Dockx, E., Langbroek, T., & Van Dijck, C. (2020). Innovatieprocessen in de Vlaamse overheid doorgelicht. *Vlaams tijdschrift voor overheidsmanagement/Vlaams Instituut voor Overheidsmanagement.-Brugge, 1996, currens*, *2020*(4), 7-23.
- Dockx, E., Verhoest, K., Langbroek, T., & Wynen, J. (2023). Bringing together unlikely innovators: do connective and learning capacities impact collaboration for innovation and diversity of actors?. *Public Management Review*, *25*(6), 1104-1127.

Chapter	Title	Research question	Method	Authors	Status[2]
5.	Explaining interactions in collaborative innovation arrangements	To what extent do the actors' home organization influence the interactions in collaborative arrangements aimed at innovation?	Exponential Random Graph Modeling (ERGM)	Tom Langbroek and Koen Verhoest	Published in *Public Policy and Administration*
6.	Conclusion	How does the composition and information structures of collaborative arrangements aimed at public sector innovation lead to innovation?		Tom Langbroek	Not applicable

Table 1. Structure of the dissertation

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Chapter 2

The effect of organizational capacities and collaborative diversity on different types of public sector innovation

ABSTRACT

Governmental organizations increasingly turn to innovations in order to solve wicked problems. As a result, they increasingly collaborate with a diverse array of external actors. By doing so, resources and insights can be combined but it also adds more complexity to the innovation process. Moreover, these organizations must have capacities to be able to innovate. In this study we examine what organizational capacities and diversity of the types of actors actually contribute to the development of policy, technological, service, and process innovations. The findings come from a large-scale survey among the two highest managerial levels of the Belgian federal and Flemish administration. By using Tobit models, we found that policy, technological, service and process innovations are all driven by diversity of non-public actors. Only policy innovations are driven by diversity of public actors as well. Furthermore, intra-organizational learning and the organization's availability of resources to innovate stimulate different types of public sector innovation.

Keywords: public sector innovation, collaboration, diversity, organizational capacities, tobit model

2.1 Introduction

All over the world, different kinds of innovation are increasingly the way to deal with complex problems in the public sector. As society is becoming more complex, governments are less able to fall back on standard procedures and have to innovate in order to solve these wicked problems (Bommert, 2010; Torfing, 2019). As a result, governments develop and implement different types of innovations such as in policies, services, technologies and administrative processes (De Vries et al., 2016; Gieske et al., 2019).

Although existing research hardly systematically differentiates between the different types of innovation, research shows that governmental organizations need to have certain capacities to be able to innovate, such as the capacity to learn or munificence of resources (Demiricioglu, 2021; Cinar et al., 2019). Still, increasing fragmentation in society forces governmental organizations to collaborate with actors beyond the scope of their own organizational borders. Hence, research on public sector innovation through collaboration has gained increasingly more attention in recent years as well, suggesting that collaboration is indeed an effective way to develop innovations (Mandell & Steelman, 2003; Ansell & Torfing, 2014; Barrutia & Echebarria, 2019).

As complex social problems often exceed the competence and expertise of the own government organization, collaboration is regarded to be a good way to come to an effective, innovative solution for wicked problems. Recent studies acknowledge the positive influence of participation in collaborative arrangements on the development of public sector innovations (Crosby et al,. 2017; Torfing, 2019, Gieske et al., 2019). A core argument in favor of collaboration is that it allows organizations to learn from each other. Collaboration for innovation ensures the grouping of intangible resources, such as different perspectives and ideas towards the problem at hand (Bommert, 2010; Torfing, 2019). This allows organizations to learn from each other; especially when organizations have routines to learn from interactions with others, so-called inter and intra organizational learning capacities (Ansell & Torfing, 2014; Gilsing & Duysters, 2008; Gieske et al., 2019). Moreover, tangible resources such as financial resources or production resources can be combined when collaborating (Keast et al., 2006; Meuleman, 2018). Hence, diversity of actors is regarded as beneficial for collaborative innovation (Ansell & Torfing, 2014:11).

However, diversity of actors in collaborative innovation arrangements demonstrates an interesting, inherent tension. Diversity allows the aforementioned combination of resources and expertise of different actors, resulting in a more nuanced view towards the problem at hand and better accessibility to different resources (Nooteboom et al., 2007; Vangen, 2017). Furthermore, repeated collaboration in stable and closed networks that have established more or less the same worldview will stifle creativity and reduce innovation (Lewis et al., 2018). Still, a high degree of diversity in collaboration is not without its disadvantages. Commonly associated disadvantages of diversity in collaborations are misunderstandings between actors, a lack of common ground

towards the innovation and an increase of the overall complexity surrounding the problem at hand (Siddiki et al., 2017; Varda & Retrum 2015; Cinar et al., 2019). Thus, developing public sector innovations through collaboration is inherently linked to the tension between the advantages and disadvantages of diversity of the collaborative arrangement.

Although this tension has been acknowledged in the literature, no study so far has examined different types of innovation in relation to diversity of the collaborative arrangement and organizational capacities. Studies tend to focus on case studies with a single type of innovation (e.g. Giest, 2019; Stevens & Agger, 2017) but no systematic study examining the influence of organizational capacities and diversity on different types of innovation exists. The current state of the literature does not provide an answer if certain organizational capacities and diversity in the collaboration spur or hinder different types of innovation.

Moreover, these mentioned types of innovation are all different in nature. For example, innovations in administrative processes touches more upon the own (governmental) administration whereas technological innovations center on end-users outside the public domain as well, such a citizens or private companies (Walker, 2014; Voorberg et al., 2015). Still, little is known about what kind of diversity in terms of actor types (diversity in public actors or in non-public actors) affect the development of different kinds of innovation. Also, a systematic comparison concerning the way organizational capacities, such learning routines and the munificence of resources, enhance different types of innovation is lacking.

This study examines to what extent organizational capacities and diversity of actors lead to the development of different types of innovation by answering the following research question:

To what extent do organizational capacities to innovate and diversity in collaborative arrangements aimed at innovation lead to different types of innovation?

This question is answered with a quantitative analysis performed on data gathered among civil servants working at the two highest levels of the Belgian federal administration and Flemish administration. This chapter starts with a theoretical overview of the current state of the literature; then the data gathering method and

the way of analysis is discussed. The chapter concludes after the presentation of the results with a discussion and conclusion.

2.2 Theoretical framework

2.2.1 Public sector innovation

Although research on innovation has gained more attention in recent years, it is certainly not a new phenomenon to study. Classic authors, such as Schumpeter have been studying innovation since the first half of the twentieth century (Schumpeter, 1942). Whereas innovation used to be a concept closely related to the field of economics and business administration, in past years it has gained increasing attention from scholars in political science and public administration (e.g. Hartley, 2005; Walker, 2006; Osborne & Brown, 2011; Arundel et al., 2019). The way governments can improve their services, procedures and policies towards citizens by innovating is highly topical in recent years.

As a result, the literature on public sector innovation is increasingly growing. Yet, it lacks consensus on a clear definition of the concept. The literature review of De Vries et al. (2016) provides a systematic overview on the conceptualization of innovation and shows that usually two recurring elements are brought forward in defining the concept: first, definitions focus on innovations being a perceived novelty in a given context, and second, definitions include the first adoption of an idea by a given organization.

Innovation not necessarily involves an improvement in all cases, but must be seen as a process that aims to solve a problem with a new solution (Sørensen & Torfing 2012; Meijer, 2014). It does concern the implementation of something new in a given context, representing a clear break with the past. This is different to optimization which is a gradual improvement in continuity with the past (Damanpour et al., 2009; Osborne & Brown, 2011).

What makes public innovation public then? One of the main difference between public and private sector innovation is the absence of competition (Mazzucato, 2013). Innovations in the public sector are not developed because of market-driven competition that forces public organizations to achieve a competitive advantage over other public organizations. Instead, innovations are developed with the desire to solve societal challenges and its aim is to create public value with the innovation and not market value (Crosby et al., 2017).

The innovation literature distinguishes between different types of public sector innovations. The conceptual study by Hartley (2005), for example, mentions seven different categories, while De Vries et. al (2014) identify four. In this study we use the commonly used distinction between policy innovations, technological innovations, service innovations, and process innovations (see for example Gieske et al., 2019). First of all, there are **policy innovations**. Developing new policies to deal with climate change can be considered as examples (see Hughes et al., 2020). The second type of innovation is **technological innovation**. This type of innovation entails the creation or use of new technologies, introduced to render services to users and citizens. An example of this is the creation of so-called Smart Cities that use 'smart' technologies to strengthen the urban system, such as the introduction of sophisticated traffic regulation (Meijer & Bolívar, 2016). A third type of innovation is **service innovation**. Here, the government offers a new type of service that was not offered before. Providing early intervention group therapy for drug abusers who are still able to properly function in society provided by a municipality is an example of a service innovation (Pelkonen & Valovirta, 2015). The last group to be distinguished is **process innovation**, which refers to new internal and external processes of the government administration. An example is a 'Tell us once' procedure that removes the citizens' need to separately notify different government services in case of a death, because a unique reference number is circulated among the different government services (Simmons & Brennan, 2017).

2.2.2 Organizational capacities

The question then rises how these different types of public sector innovations come about. Several key organizational capacities, such as the ability to learn and resource munificence, which are associated with innovation are becoming more important as collaboration with external actors is increasingly being used to develop innovations (Ansell & Torfing, 2014; Crossan et al., 1999).

Proposals for collaborative innovation are based on the assumption that the access of a wide range of actors, all with the capability to actively participate in the innovation process, will increase the quantity and quality of innovations (Bommert, 2010; Lewis et al., 2018). In this respect, one of the main advantages of collaboration is that external ideas are internalized (Bommert, 2010). It allows organizations to gather new insights and knowledge (Crosby et al,. 2017; Torfing 2019, Gieske et al., 2019). Collaborative innovation emphasizes the need to work together with different actors to generate innovative ideas that one could not come

up by themselves and to be able to create an outcome that is larger than the sum of its parts. In this respect, recent literature has emphasized the capacities for public sector organizations to innovate (Demircioglu, 2021; Cinar et al., 2019). A key capacity an individual organization can have in an innovation process is the capacity to utilize its knowledge sources (Ansell & Torfing, 2014; Gilsing & Duysters, 2008; Gieske et al., 2019). Hence the organization has to have the capacity to learn in order to be able to innovate. On an organizational level, the capacity to learn can either be inter-organizational and intra-organizational (Van Buuren & Loorbach, 2009; Crossan et al., 1999). Inter-organizational learning capacity refers to the ways the organization facilitates learning in the collaborative arrangement in which the organization takes part. For example, the extent to which the organization uses pilots and experiments to test new solutions with other actors or to which extent the organization stimulates joint learning with other actors outside of the organization (Gilsing & Duysters, 2008).

Next, intra-organizational learning concerns the way the organization learns from new knowledge that is brought into the organization based on the experiences of an individual, but also more systematic in the sense that the organizations' policies and processes are regularly adjusted to new insights (Crossan et al., 1999). Related, the organization needs to have the resources to implement the innovation. Resources enable the organization to properly develop and implement the innovation, while the regular tasks of the organization do not suffer from it (Gieske et al., 2019). As collaborative innovation allows public organizations to obtain scarce and otherwise inaccessible resources, it is often mentioned as a superior way to innovate compared to in-house innovations (Torfing, 2019). This assumption indicates that resources are fundamental to the development of public sector innovations. Organizational resources that have been attributed to the development of public sector innovation are sufficient funding for the innovation (Levine & Wilson, 2013), the presence of staff that can deal with the innovation (Weber et al., 2014), and information technology infrastructure (Bazemore et al., 2010).

These three concepts -resources, intra and inter-organizational learning- are believed to be essential building blocks for innovation, hence we hypothesize:
H1: Inter-organizational learning capacity stimulates all four types of innovation.
H2: Intra-organizational learning capacity stimulates all four types of innovation.
H3: Innovation capacity concerning resources stimulates all four types of innovation.

2.2.3 Collaboration for innovation and diversity of partners

As the aforementioned capacity to learn already implies, organizations can learn from people inside the organization, but also from actors outside the organization. Moreover, if organizations do not have enough innovative capacity concerning resources, such as funding or staff, collaboration with others helps them in gathering the resources. Collaboration with a wide variety of actors is in this respect a clear advantage over the development of innovation by one single organization (Siddiki et al., 2017). However, collaboration also brings more complexity to a process that already involves a lot of uncertainty (Bason, 2014:222; Klijn et al., 2010). Innovation is a process to develop and/or implement something that does not yet exist in the given context. Actors do not know to which extent their endeavors will succeed and the risk of failure is considerable. They invest resources such as time and financial means while they are not sure that they will see their investment result in meaningful outcomes. It is virtually impossible to have built-in guarantees against opportunistic behavior since no one knows what kind of opportunistic behavior can be expected (Klijn et al., 2016). Collaboration with a lot of different actors can refrain actors from entering the collaboration process as it can decrease trust among actors (Giest, 2019). Collaboration is associated with more complexity in obtaining goal congruence and mutual understanding (Siddiki et al., 2017; Varda & Retrum, 2015; Cinar et al., 2019). For that reason, more diversity of the collaborative arrangement can also be a hindrance to innovation. The extent to which public organizations collaborate with a variety of public and/or private actors and the extent to which this results in different kinds of innovations are crucial questions to ask in this respect.

Recent literature has examined various aspects of how collaboration leads to innovation (e.g. Godenhjelm & Johanson, 2018). What these studies have in common is that the relationship between collaboration and innovation is either studied in a case study with a specific innovation being the outcome (e.g. Smith et al, 2019) and/or public sector innovation is treated as an unambiguous concept without taking the different types of innovation into account (Agger & Lund, 2019). However, the aforementioned conceptualization of innovation shows that different types of innovations can be distinguished (Gieske at al., 2019; De Vries et al., 2016). It is a clear gap in the current public sector innovation literature that no systematic comparison has been made between the different types of innovation and how the diversity of the collaborative arrangement influences the development of these different types.

Empirical research on the impact of diversity on innovative outcomes can focus on both intra-organizational diversity as inter-organizational diversity. Research on diversity in relation to innovation tends to focus especially on intra-organizational diversity being for example diversity concerning age, cultural background and gender within the organization (Bouncken et al., 2016; Demircioglu, 2021; Mothe et al., 2021) Studies on diversity in inter-organizational innovation networks often mention the concept of 'heterogeneity' in this respect. Heterogeneity in innovation networks is marked by differences in goals, perceptions, capacities, power, and the actors' cultures, and practices (Corsaro, Cantù, & Tunisini, 2012; Siddiki et al. 2017). So far, little research has been done on innovation networks concerning diversity of public actors (such as other governmental organizations) compared to diversity of non-public actors (such as private organizations, research institutions, citizens and non-governmental organizations). Additionally, research whether a higher diversity of public or non-public actors in the collaborative arrangements leads to an increase or decrease of the development of specific types of public sector innovations is scarce.

Following from existing research we can formulate the argument that the advantage of diversity of public or non-public actors depends on the specific type of innovation. For example, the focus of process innovations are on enhancing the quality and efficiency of processes, such as the creation of new organizational forms, the introduction of new management methods and techniques and new working methods (Walker, 2014; De Vries et al., 2016). These innovations are mostly focused on administrative processes within the own organization or between sort-like organizations. Hence, the innovation is very much focused on the own (governmental) organization. As the development of these innovations is very organization-specific the argument can be made that it would make less sense to collaborate with a wide variety of external non-public actors such as citizens and non-profit organizations for the development of a new process within a government organization. Not only lack external actors the necessary knowledge or resources, but given the traditional closed character of government bureaucracies, civil servants might also be reluctant to open up the organization for the development of internal process innovations to external, non-public actors (Bommert, 2010).

Contrary, for service and policy innovations the argument can be made that they benefit from collaboration with a wide variety of actors (both public and non-public) as these types of innovation lend themselves better for an open process of

co-production between public and non-public actors (Osborne, 2017; Jefferies et al, 2021). Unlike process innovations, service and policy innovations can be regarded as types of innovations that are less 'in-house' oriented as they center on end-users outside the public domain as well, such a citizens or private companies (Voorberg et al., 2015). As these innovations are much more focused on end-users outside the public domain, mobilizing a diverse set of public and non-public actors helps to extend the range of creative ideas to solve the problem at hand, to select the most promising ones, to mobilize resources, and to diffuse the innovation through the recruitment of a large number of potential ambassadors of the innovation (Torfing, 2019; Voorberg et al., 2015; Nesti, 2018).

These advantages also apply to some extent to the development of technological innovations. However, the focus of technological innovations is on the creation or use of new technologies, introduced in an organization to render amenities to users and citizens (De Vries et al., 2016). Complexity related to technical difficulties of software or platforms is commonly named as a barrier to innovate in the public sector (Costa et al., 2013; Ezzamel et al. 2014; Cinar et al., ,2019). Lack of expertise within the governmental organization is a hindrance for the development of technological innovations and forces public organizations to collaborate with external partners (Meijer, 2015; Cinar et al.,2019). In this respect, it can be expected that technological innovations are best developed with a higher diversity of non-public actors. Collaboration with end-users, such as citizens can generate ideas about the requirements of the new technological innovation. For the actual development and implementation governments may try to involve specialized private businesses and research institutions to co-create the innovation.

Following this logic, we formulate the following hypotheses:
H4: Only a higher diversity of public actors increases the development of process innovations.
H5: A higher diversity of both public actors as non-public actors increases the development of service innovations.
H6: A higher diversity of both public as non-public actors increases the development of policy innovations.
H7: Only a higher diversity of non-public actors increases the development of technological innovations.

2.3 Methodology

2.3.1 Data collection

The research question is answered by a quantitative analysis based on data collected from the two highest managerial levels of both the Belgian federal and Flemish administrations. In addition to a federal government, Belgium consists of several autonomous regions, of which Flanders is one, which, like the federal government, each have their own competences. Both governments have their own executive and legislative power within their respective domains. In addition, they both have their own parliament, ministers and administrative support. Therefore, we argue that the federal and the Flemish government are comparable and that both governments can be considered as full-fledged governments.

Data was gathered in the period September until December 2019 through an online survey. The survey for the federal respondents was distributed using an internal database of the federal administration containing the contact details of the target population. A contact person working for the federal government sent out the questionnaire to the target population using an email account from the Belgian federal government. That way, the research team was able to distribute the questionnaire to managers whose email addresses were not publicly available, but never got these addresses in their possession and thus conforming to the EU General Data Protection Regulation (GDPR) rules. For the managers of the Flemish government, the same online survey (adjusted to the Flemish context) was distributed by the research team to managers whose email addresses were publicly available online. Managers at the federal level could choose to fill out the survey in either the Dutch or French language, as Belgium is a predominantly Dutch and French speaking country and federal civil servants speak at least one, if not both, of these languages. The bilingual research team ensured that both versions of the survey were identical. The survey for the Flemish government was only distributed in Dutch as Flanders is a Dutch speaking region. Two rounds of pilot testing with civil servants from both the federal as Flemish government improved the survey in terms of comprehensibility, ease of filling out the survey, and matching the (e.g. organizational and political) context of respondents. The survey for managers at the highest management level referred to the organization as a whole. The questions for the managers on the level below referred to the organizational unit they are responsible for. Respondents can best answer questions that refer to their direct work environment, and hence respondents on the lower level might not have a clear view what happens in other parts of the organization. Hence, whereas the respondents at the highest managerial level received questions about the entire

organization, the managers at the second highest management were asked to refer to the organizational unit they are responsible for as a manager.

The response rate on the federal survey was 36.5% (157 completed surveys) and of the Flemish survey 62.5% (288 completed surveys). Leading to a dataset of 445 respondents in total.

A chi-square goodness-of-fit test was executed to determine whether the data sample formed a good representation of the ascribed respondents. The data sample was compared against the managerial level and organizational type of the total the ascribed respondents and did not show a significant difference, confirming that the sample is a good representation of the two highest managerial levels in the federal and Flemish government.

2.3.2 Dependent variables

The four different types of innovation as described in the theoretical framework are the dependent variables in this study. The extent of developed innovations per type was measured on a seven-point scale ranging from 'not at all' (1) to 'to a very high extent' (7) with a question based on the items used by Gieske et al. (2019):

In the last 3 years, to what extent were actually new policies, technologies, services and/or processes developed by your organizational division - alone or in collaboration with others inside or outside your organization?

- *Really new policies (really new, different from existing policies)*
- *Really new technologies (really new, different from existing technologies)*
- *Really new services (really new, different from existing services)*
- *Really new processes (really new, different from existing processes)*

These four items were used as four different dependent variables.

2.3.3 Independent variables

Diversity

Respondents were asked to what extent their organization(al unit) collaborated for the development and implementation of innovations. If they answered 'to a little extent' or higher (2 or higher on a 7 point Likert-scale) they were then asked to indicate on a 7 point Likert-scale to what extent their organization(al unit) collaborated with different other types of actors in the last 3 years with the goal to

develop and/or implement an innovation. They had to do this for eight different types of actors; each type of actor being a different item.

Two separate diversity indexes were then calculated: public diversity and non-public diversity.
The public diversity index was calculated by adding the scores for collaborating with public actors:
(1) other ministries or agencies in the policy domain to which they belong
(2) other bodies in the [federal or Flemish] government which belong to other policy domains
(3) governmental organizations at other levels of government
(4) European or international actors

The scores were then recoded by subtracting 4 points to ensure that a value of 0 (instead of 4; four actors with a score of one) corresponded with complete absence of public diversity. The corresponding maximum score is thus 24, indicating diversity to a very high extent with all public actors.

Likewise, a same index was calculated for non-public diversity consisting of the sum of collaboration with actors outside the government administration being:
(1) private companies
(2) non-profit organizations
(3) research institutions
(4) citizens

Inter and intra organizational learning capacity and innovation capacity
The inter and intra organizational learning capacity and innovation capacity concerning resources of the organization, based on the work and items used by Gieske et al. (2019), were included in the analysis[3]. These capacities were included

[3]**Innovation capacity (resources):** Our human resources management (HRM) values innovativeness of the employees (in selection, training, career support, personnel evaluation); Resources (money/time) are allocated well to regular tasks and innovation; ICT and new technologies are a strong enabler for innovation; There are enough resources (money/time) for innovation
Intra-organizational learning capacity: Our policies and routines are regularly adjusted to new insights or techniques**;** There are routines (e.g. like in planning cycles) to reflect on what new insights and knowledge mean for the organization; My organization learns optimally from my experiences
Inter-organizational learning capacity: My organization stimulates joint learning with and from other parties outside our organization; We use pilots and experiments to test new solutions with

to examine to what extent the capacities of the own organization influence the development of the different types of innovation. A principal axis factoring (PAF) with varimax rotation was conducted on the ten items measuring inter- and intra-organizational learning and innovation capacities concerning resources. The Kaiser-Meyer-Olkin measure verified the sampling for the analysis, KMO= 0.873, and all KMO measures were > 0.736, which is above the acceptable limit of 0.5 (Field, 2009). Bartlett's test of sphericity indicated that correlations between items were sufficiently large for PAF, with χ^2 (45) =2114.359, p<.001.

Additional analysis showed that the items load on three underlying factors that in combination explain 70.541% of the variance. Three factors representing the inter and intra organizational learning capacity and innovation capacity concerning resources were retained. The Cronbach's alpha scores of > 0.756 indicate reliable scales as these values are well above the generally accepted cutoff point of 0.70. Three new variables measuring the underlying concepts were created based on the factor scores using the regression method.

Control variables

Several control variables related to personal characteristics were included in the analysis: age group, gender, educational level, and the organizational identification of the respondent[4]. This latter variable was included in the analysis as research suggests that organizational identification is associated with positive organizational features, such as more loyalty to the organization (Blader et al., 2017). By including this variable we control for respondents who identify strongly with their organization and as a result might report more positively about their organization (for example by stating that their organization is highly innovative). Furthermore, an item measuring 'stimulating leadership' was included as well. Respondents were asked whether their minister encourages innovation and creativity, as a lack of ministerial support for innovation is found to be a hindrance to public sector innovation (Cinar et al., 2019). With this variable we control for the extent to which managers operate in a political environment that is open to innovation.

Moreover, as this study concerns inter-organizational collaboration with public and non-public actors, we controlled for the organizational orientation.

other parties outside our organization; My organization learns from the collaboration with other parties

[4] When someone criticizes the organization, it feels like a personal insult.

Respondents were asked whether their organization(al unit) is oriented (1) towards the own and other public organizations, (2) towards citizens, private and non-profit actors, or (3) an equal combination of both, In this way, we were able to control whether the diversity of collaboration with public and non-public actors is related to the type of innovation while controlling for the day-to-day orientation of the organization(al unit).

As respondents are nested within organizations, organization dummy variables were included in the models. That way, we could examine the hypotheses while controlling for the organization of the respondent and the administrative level.

Statistical analysis

To test our hypotheses we employed four different Tobit regression models; one for every different type of innovation. We choose this type of regression as this is from an econometric stance preferred over ordinary least square (OLS) models. Tobit models can deal with the issue that the values of our variables are bounded between 1-7 (1-24 for the diversity variable) by fixing the lower and upper bounds in its analysis. OLS models do not take this issue into account which might lead to inaccurate results (McDonald & Moffitt 1980; Breen, 1996). The interpretation of Tobit models is slightly different than in OLS models. Contrary to OLS models, the β coefficient should not be interpreted as the linear effect of the independent variable on the observed outcome, but instead of the independent variable on the uncensored latent variable (see McDonald and Moffitt, 1980). The β coefficient and level of significance thus give a more accurate result of the hypothesized relations.

Common method bias

Several measures were taken to reduce common method bias as the data is self-reported by the respondents and the data is cross-sectional. To begin, total anonymity for the respondents was guaranteed to avoid to the risk of socially desirable answers. Furthermore, the online survey consisted of different parts (e.g. organizational characteristics, innovation, collaboration) which were separated from each other through 'page breaks'. The questions concerning the independent variables and dependent variables were placed in different parts of the survey and a respondent was not able to see all questions at the same time on the same webpage; they were completely separated from each other. Moreover, to adapt the survey to the right context and to reduce item ambiguity, the survey was piloted twice among both federal and Flemish civil servants. The survey was then adjusted based on their feedback. To statistically assess whether the data was not affected

by common method bias we performed a Harman's single factor test (Podsakoff et al., 2003). A single exploratory factor analysis was executed on the dependent, independent and control variables to observe whether one of the variables accounted for more than 50% of the total variance. This was not the case. With this finding and the procedural measures that were taken, it was argued that common method bias did not influence the results.

2.4 Results

The results indicate that inter-organizational collaborations for the development of innovations have a higher diversity concerning public collaboration (11.40 on a scale 0 - 24) than private collaboration (9.52 on a scale 0-24). Moreover, although differences are small, most of the developed innovations are process innovations (4.40 on a scale 1-7), followed by policy (4.36), technological (4.14) and service (4.10) innovations.

Some independent variables are slightly correlated, but multicollinearity is not an issue as the variance inflation factor (VIF) is 3.54, and thus falls comfortably in the commonly accepted range (1 - 5) in which multicollinearity is regarded as being acceptable.

The models show (table 2) that diversity is indeed a factor that stimulates the development of innovation. Looking at the distinction between collaboration with a diversity of public actors and non-public actors, we find that both a higher diversity of public and non-public actors positively influences the development of policy innovations. Contrary, technological, service and process innovations are only stimulated by diversity of non-public actors and these types of innovation do not show a significant result with diversity of public actors. Although the diversity variables have strong significant effects ($p<0.01$, except for non-public diversity in the development and implementation of policy innovation which is $p<0.1$), the coefficients are rather low. The strongest 'diversity effect' is found of non-public diversity on service innovations. These results indicate that diversity of the collaborative partners is an antecedent for the types of innovation, but that its effect is limited.

Stronger effects are found concerning the organizational capacities. We find that especially the organization's resources and the intra-organizational learning capacities are an important predictor for the development of innovations. The availability of the organization's innovation resources stimulates the development

of both policy and technological innovations. Furthermore, the organization's intra-organizational learning capacity is an indicator for policy, service and process innovations. The organization's inter-organizational capacity does not show a significant result with any of the types of innovation.

Concerning individual characteristics, we find that only few variables have a significant relation with the different types of innovations. Respondents who identify strongly with their organization report that their organization is less involved in the development and implementation of technological innovations. Furthermore, the respondent's age is a significant variable for all types of innovation. Respondents between the age of 50 of 59 indicate that their organization(al unit) is significantly more involved in the development and implementation of all types of innovation.

Finally, the orientation of the organization(al unit) shows a significant result for policy and process innovations. The organization(al unit) of respondents who indicate that the orientation of their organization(al unit) is mainly towards citizens, private and non-profit actors is significantly more involved in the development and implementation of policy innovation. In contrast, the organization(al unit) of respondents who indicate that the orientation of their organization(al unit) is an equal combination between an orientation towards citizens, private and non-profit actors, and towards the own and other public organizations is significantly less involved in the development and implementation of process innovations.

	Policy innovations	***Technological innovations***	***Service innovations***	***Process innovations***
	Coefficients & standard errors			
(A) Individual characteristics				
Age	*x^2(3) 3.40***	*x^2(3) 2.44**	*x^2(3) 3.25***	*x^2(3) 3.29***
• 40-49	0.51 (0.28)*	0.35(0.25)	0.24 (0.27)	0.39 (0.25)
• 50-59	0.53 (0.29)*	0.54 (0.26)**	0.49 (0.28)*	0.42 (0.25)*
• 60+	-0.04 (0.33)	0.16 (0.30)	-0.10 (0.30)	-0.09 (0.29)
Education	*x^2 (3) 0.34*	*x^2 (3) 0.30*	*x^2 (3) 0.59*	*x^2 (3) 0.41*
• Bachelor	0.69 (0.88)	0.34 (0.80)	-0.31 (0.86)	0.07 (0.78)
• Master	0.28 (0.76)	-0.04 (0.69)	-0.44 (0.74)	-0.32 (0.67)
• PhD	0.35 (0.79)	-0.01 (0.71)	-0.19 (0.77)	-0.33 (0.69)
Gender	-0.04 (0.14)	-0.04 (0.13)	0.05 (0.14)	-0.05 (0.12)
Task orientation	*x^2 (2) 5.71****	*x^2 (2) 0.48*	*x^2 (2) 1.07*	*x^2 (2) 3.99***
• Private	.36 (0.20)*	-0.10 (0.18)	0.13 (0.20)	-0.02(0.18)
• Public and private	-0.29 (0.20)	-0.17 (0.18)	-0.14 (0.19)	-0.42 (0.17) **
Organizational identification	0.01 (0.05)	-0.18 (0.05)***	-0.03 (0.05)	-0.03 (0.04)
Stimulating leadership	0.01 (0.06)	0.00 (0.05)	0.03 (0.06)	0.05 (0.05)
(B) Organizational capacities				
Inter-organizational learning	0.15 (0.09)	0.09(0.08)	0.09 (0.09)	0.06 (0.08)
Intra-organizational learning	0.16 (0.09)*	0.25 (0.08) ***	0.10 (0.09)	0.22 (0.08) ***
Resources	0.20 (0.09)**	0.31 (0.08)***	0.19 (0.08)**	0.09 (0.08)
(C) Diversity				
Public diversity	0.07 (0.02) ***	0.02 (0.08)	0.03 (0.19)	0.03 (0.02)
Non-public diversity	0.04 (0.02) *	0.08 (0.02)***	0.11 (0.02) ***	0.08 (0.02)***
N	408	408	409	409
Log likelihood (a)	-738.72	-704.63	-734.906	-688.408
Log likelihood (a and b)	-720.45	-672.76	-718.195	-671.233
Log likelihood (a, b and c)	-646.39	-605.10	-638.371	-596.275
McFadden's R2 base model (a)	0.102	0.127	0.094	0.120
McFadden's R2 full model (a, b and c)	0.153	0.190	0.151	0.174

Table 2. Results. Note: Standard errors of coefficients in parentheses. All models include organization dummies.

2.5 Discussion and conclusion

This chapter started from the premise that different types of innovation can be distinguished (Hartley, 2005; De Vries et al., ,2016; Gieske et al., 2019), but a systematic analysis on how these different types of innovation come about is lacking. The aim of this chapter was to better grasp how inter-organizational learning, intra-organizational learning and innovation capacity concerning resources lead to different kinds of innovation (Van Buuren & Loorbach, 2009; Crossan et al., 1999; Gieske et al., 2019). Moreover, it was argued that collaboration is increasingly seen as the tool that is crucial for developing and implementing public sector innovations (Bommert, 2010; Lewis et al., 2018; Torfing, 2019). However, collaboration with a diversity of actors has the inherent tension that while a greater diversity of actors can ensure the inclusion of multiple perspectives and resources, it also makes the innovation process more complex (Siddiki et al., 2017; Varda & Retrum 2015; Cinar et al., 2019). With this study we wanted to examine to what extent this tension applies to different types of innovations, as research on collaborative diversity and its effect on different kinds of innovation is lacking.

Hence, seven hypotheses were tested.

Hypotheses	**Result**
H1: Inter-organizational learning capacity stimulates all four types of innovation.	Fully rejected
H2: Intra-organizational learning capacity stimulates with all four types of innovation.	Partly confirmed
H3: Innovation capacity concerning resources stimulates all four types of innovation.	Partly confirmed
H4: Only a higher diversity of public actors increases the development of process innovations	Rejected
H5: A higher diversity of both public as non-public actors increases the development of policy innovations	Confirmed
H6: A higher diversity of both public actors as non-public actors increases the development of service innovations	Rejected
H7: Only a higher diversity of non-public actors increases the development of technological innovations	Confirmed

Table 3. Hypotheses

The analysis confirms that diversity of actors of the collaborative partners indeed has a positive effect on the realization of public sector innovations (Nooteboom et al., 2007; Vangen, 2017). However, not all types of diversity stimulate the development and implementation of public sector innovation. All types of innovations are driven by diversity of non-public actors, while policy innovations are also driven by diversity of public actors.

Concerning the organizational characteristics: intra-organizational learning and the availability of innovation resources within the organization positively influences the development of certain innovations. The findings imply that public sector organizations that have procedures to learn from new knowledge, insights, experiences, or techniques develop and implement more policy, technological, and process innovations. Moreover, organizations that have resources such as ICT, financial resources, staff trained in innovation, and resources that are well distributed between both innovation and regular practices develop and implement to a higher extent policy, technological, and service innovations. Remarkably, organizations that stimulate learning from external actors (inter organizational learning) do not significantly develop or implement more of any type of innovation. Additionally, organizations that are oriented on both public and private actors develop and implement to a fewer extent process innovations.

This study is one of the first studies to systematically compare how different types of innovations come about. It distinguishes itself from studies that examine public sector innovations on the basis of a single or multiple case study (e.g. Giest, 2019) or studies that make no distinction between different types of public sector innovation (e.g. Agger & Lund, 2019). This study therefore makes an important contribution to the literature on the development of public sector innovation through collaboration. The results show that the development of various types of innovation are stimulated in different ways but that non-public diversity stimulates the development and implementation for each type of innovation. This study brings an important nuance to the collaborative innovation narrative with these findings (Bommert, 2010; Torfing, 2019). It shows that collaboration can be important but that a large diversity of actors is certainly not necessarily a crucial condition to develop public sector innovations. Collaborative innovation should not necessarily be opened up to all kinds of external actors as diversity concerning public actors does not contribute to the development of technological, service, and process innovations. However, no negative results concerning diversity and its relation

with innovation were found which implies that diversity of actors does not hinder the development and implementation of public sector innovations.

The findings strengthen to some extent the work by authors claiming that diversity of actors is beneficial for the development of public sector innovations (e.g. Siddiki, Kim, and Leach 2017), while at the same time it opposes the argument that too much diversity hinders public sector innovation (Bason, 2014:222; Klijn et al., 2010). Still, the effect of diversity on the different types of innovation is limited. Instead, the results suggest that the organizational capacities concerning resources and intra-organizational learning, and task orientation are a stronger predictor for the development and implementation of the different types of innovations.

Although the analyses show clear results and support several of the hypotheses, some findings are not what was expected. For example, it is notable that having more inter-organizational learning capacity does not lead to the development of public sector innovation. Hence, based on the findings is can be concluded that stimulating to learn from others outside the organization, and to experiment with others does not influence the development and or/ implementation of public sector innovation. This is remarkable on theoretical grounds as for example Gieske et al. (2019) did find that this kind of learning capacity is positively associated with public sector innovation. Moreover, the finding that organizational identification is negatively associated with technological innovations, and the finding that process innovations are stimulated by a diverse non-public collaborative arrangement are contrary to what was expected. This latter finding is especially remarkable because process innovations mainly concern internal government processes (Walker, 2014). Therefore, the finding that only non-public diversity stimulates this type of innovation is somewhat contradictory. Further research should study the logic behind this finding.

This brings us to one of the main limitations of this study. The classification public/non-public diversity can be regarded as somewhat binary and different types of actors are therefore grouped together that may be very different from each other. This can raise the question whether for example private companies and citizens are similar types of actors that should be grouped together. Exploratory additional analyses in which the separate actors were added to the model instead of the two diversity indexes showed that collaboration with private companies in particular has a significant relationship with the different types of innovation. Therefore, it could be that collaboration with private companies strongly influences

the effect of our variable 'non-public diversity' and much collaboration with other 'non-public actors' besides private firms does not necessarily promote innovation. Regardless of this observation, the result does indicate that collaboration with actors outside the government administration has a positive influence on the development of different types of innovation.

To conclude, the findings have a clear practical value besides its theoretical relevance. From a practitioner's point of view, the findings shed a light on the characteristics of public sector organizations when they develop and/or implement innovations. The organization's possession of innovation resources and/or the ability to learn from new knowledge and experiences drives the development and implementation of public sector innovations. It is thus recommended that public sector organizations makes sure that these capacities are well-developed within the organization when engaging in an public innovation processes. Moreover, the findings enable managers in governmental organizations to decide with which partners to collaborate. As the findings suggest, collaboration with non-public actors is always advised. When the innovation entails the development and implementation of new policies, diversity of public actors is advised as well.

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Appendix Chapter 2

Descriptive results

Variable	Mean	SD	Min	Max		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Age	3.65	0.82	2	5	(1)	1.00										
Education	3.09	0.44	1	4	(2)	-0.06	1.00									
Gender	1.38	0.49	1	3	(3)	-0.16	0.05	1.00								
Task orientation	1.95	0.81	1	3	(4)	0.11	0.11	-0.03	1.00							
Organizational identification	4.09	1.39	1	7	(5)	-0.02	-0.05	0.03	-0.07	1.00						
Stimulating leadership	4.93	1.42	1	7	(6)	0.02	-0.01	0.09	-0.07	0.07	1.00					
Inter-organizational learning	0.00	0.91	-2.60	2.37	(7)	0.08	0.05	0.00	0.07	0.00	0.35	1.00				
Intra-organizational learning	0.00	0.84	-2.66	2.06	(8)	0.07	-0.04	-0.07	-0.08	0.20	0.23	0.13	1.00			
Resources	0.00	0.94	-2.10	2.49	(9)	0.12	0.16	-0.04	-0.03	-0.01	0.21	0.03	0.02	1.00		
Public diversity	11.40	5.09	0	23	(10)	-0.03	0.19	0.00	0.19	0.08	0.13	0.24	0.17	0.17	1.00	
Non-public diversity	9.52	4.81	0	24	(11)	-0.10	0.20	0.02	0.26	0.13	0.12	0.26	0.13	0.15	0.63	1.00

Chapter 3

Setting up the collaborative arrangement for the establishment of synergy

ABSTRACT

One of the main premises for the development of public sector innovation through collaboration is that working together with different actors leads to more insights into the problem at hand and that different resources can be combined. This should lead to a process where the whole is greater than the sum of all individual parts, also known as synergy. As public sector innovations are increasingly developed in collaborative arrangements, it raises the question how coordinators compose the collaborative arrangement in different phases of the innovation process with the goal to establish synergy. This qualitative study examines eight different Belgian cases in which a collaborative arrangement was established to develop public sector innovations. It was found that when composing the collaborative arrangement, coordinators commonly focus on just one phase of the innovation process at a time: idea generation or implementation. Synergy for idea generation is especially established by pulling new actors with intangible resources towards the process. In contrast, synergy for implementation is especially established in collaborative arrangements in which actors with both tangible as well as intangible resources are pushed towards the process. Here, the coordinator is oftentimes to a lesser extent able to influence the composition and directs the actors towards implementation of an already chosen innovative idea.

Keywords: Innovation, collaboration, synergy, coordination, metagovernance

3.1 Introduction

Developments in society have caused a growing need for governmental organizations to be innovative to solve societal problems (Hartley, 2005; Walker, 2006; Osborne & Brown, 2011; Arundel et al., 2019:793). Growing demand and expectations of citizens regarding the functioning of the public sector has placed considerable demands on governments' innovative capacity (Sørensen & Torfing, 2012). Moreover, increasingly complex wicked problems in a fragmented society with growing interdependencies between actors force governmental organizations

to collaborate with actors outside the own organizational borders as these problems cannot be solved with standard solutions or within the own bureaucratic organization (Wegrich, 2019; Torfing, 2019).

Complex societal problems are commonly multi-dimensional as they extend across multiple policy areas and involve multiple actors both inside and outside the government administration. Hence, opening the innovation process to external parties is considered to be beneficial for developing innovations (Voorberg et al., 2015; Frow et al., 2015; Torfing, 2019). When collaborating, synergy is regarded as a driver for innovative outcomes (Lasker et al., 2001; Cramm et al., 2012; Bressers, 2014: 103). To the end of promoting synergy, arranging a collaborative arrangement with the inclusion of the necessary actors and their resources is essential at different stages of the innovation process (Diamond & Vangen, 2017; Lewis et al., 2018; Voets & De Rynck, 2008; Corbin & Mittelmark, 2008; Loban et al., 2021). The generation of ideas and the consequent implementation of the chosen idea can be regarded as two main areas of interaction in the collaborative innovation process which require different types of actors (Sørensen & Torfing, 2011; Meijer, 2014; Keum & See, 2017). Still, the way collaborative arrangements are composed in these phases for the promotion of synergy remains a relatively untouched topic in public sector innovation literature.

In this qualitative study we examine how coordinators (also called: metagovernors) compose collaborative arrangements for idea generation and implementation in order to establish synergy. The research question is:

How do coordinators compose collaborative arrangements aimed at public sector innovation to establish synergy concerning idea generation and implementation?

This question is answered by examining eight different collaborative arrangements aimed at creating a public sector innovation. This study builds upon the metagovernance and synergy literature and examines how coordinators attempt to create synergy in different phases of the collaborative innovation process by the composition of the collaborative arrangement. Moreover, by answering this research question empirical insights are added to the still highly conceptual synergy narrative in public sector innovation literature (see e.g. Ansell & Torfing, 2014:11).

3.2 Theoretical framework

3.2.1 Defining innovation

As innovation is increasingly a way for governments to tackle societal problems, public sector innovation has gained increasing attention in academic literature (De Vries et al., 2016; Arundel, et al., 2019; Lopes & Farias, 2022). Despite conceptual ambiguity, two main recurring elements are distinguished in commonly used definitions (De Vries et al., 2016): first, an innovation should be perceived as a novelty in the given context, and second, the innovation is the first adoption of an idea by a given organization/entity. This means that innovations can exist somewhere else already, but have to be new in the given context. For example, a city adopting existing 'smart' technologies to transform itself into a 'smart city' is in the context of that specific city highly innovative to the city and its citizens (Caragliu & Del Bo, 2019). Some authors emphasize the difference between innovation and optimization as innovation involves a clear break with the past and optimization is an incremental change in how things were done before (Osborne & Brown, 2011). Furthermore, one of the main differences between public and private sector innovation is that the public sector does not innovate in order to obtain a competitive market advantage over competitors. Instead, public sector innovations try to add public value (Crosby et al., 2017; Chen et al., 2020). Public value is the quality of individual and collective life for citizens shaped by the normative consensus of society, policies, and governance (Yang, 2016; Geuijen et al., 2017).

The complexity of today's societal problems often spans multiple policy areas and involves multiple actors. As a result, public sector organizations cannot fall back on standard solutions and are more or less forced to work together for the development of an innovation (Cinar et al., 2021; Torfing, 2019). Collaboration can lead to a better understanding of the problem at hand because multiple perspectives are combined (Siddiki et al., 2017). In addition, collaboration brings together complementary resources (Diamond & Vangen, 2017; Lewis et al., 2018). Therefore, innovation through collaboration has been used by governments as strategy for the management of crises (Vlados & Chatzinikolaou, 2019), to increase the innovativeness of public services (Mergel & Desouza, 2013), and as response to societal and technological developments (Seo et al., 2018). In this respect, it is argued that policymakers have the opportunity to determine the direction of growth on these issues by making strategic investments when well-defined goals, or more specifically 'missions' are formulated. These investments can catalyst

activities between actors that otherwise would not happen and shift the playing field to the desired societal goal (Mazzucato et al., 2019; Mazzucato & Penna, 2016).

3.2.2 Composing the collaborative arrangement to establish synergy

Synergy is seen as a primary characteristic of a successful collaborative process because a collaborative arrangement can reach its full potential when synergy occurs (Corbin et al., 2006; Corwin et al., 2012; Corbin et al., 2018). Synergy can be defined as *combining the individual perspectives, resources and skills of the partners, [so that] the group creates something new and valuable together - a whole that is greater than the sum of its parts* (Lasker et al., 2001). In this regard, synergy can be seen as the outcome of the process, such as a successful innovative outcome (Weiss et al., 2003) or as a process in itself as well, including feelings of excitement and progress, and resource complementarity (Jones & Barry, 2011).

Studies on partnership effectiveness (such as Wandersman et al., 1997), have examined how partnerships turn resources into products. The milestone study of Lasker and colleagues (2001) mentions different determinants for synergy. These include partner and partnership characteristics, relationships among partners, the external environment and resources. Recent research has shed more light on these determinants. For example, concerning the partner and partnership characteristics and the relationships among partners, synergy is spurred by equity between partners, and clarity and consensus on governance and decision-making processes (Rafter et al., 2022).

Next, effective leadership is found to be an enabler for synergy as it facilitates interactions among actors by facilitating open dialogue, connecting actors with each other, and revealing and challenging assumptions that limit thinking and action (Loban et al., 2021). These activities are also referred to as 'metagovernance'. Metagovernance is *'a practice by (mainly) public authorities that entails the coordination of one or more governance modes by using different instruments, methods, and strategies to overcome governance failures.'* (Gjaltema et al., 2020). The metagovernor can apply different management styles and activities to coordinate the collaborative arrangement towards the end goal. For example, strategies concerning the arrangement of the collaboration by inviting critical actors, introducing process rules such as entrance and exit rules, connecting actors with each other, and exploring content (Klijn et al., 2016).

Effective metagovernance for synergy is strongly associated with being able to mobilize the necessary resources in the collaborative arrangement. The sufficiency of both tangible resources (such as financial means) and intangible, nonfinancial resources (such as knowledge) have been linked to synergy (Weiss et al., 2003; Corbin & Mittelmark, 2008; Loban et al., 2021). Sufficiency of nonfinancial resources is particularly important in innovation projects as innovative ideas can emerge when different points of view are combined, and by pooling resources, it also improves the collaborative arrangement's capacity to implement the innovation (Waldorff & Kristensen, 2014: 102; Stevens & Verhoest, 2016; Torfing, 2019). An effective metagovernor is therefore someone who includes the necessary resources and facilitates an adequate way of bringing these resources together. Hence for the reason of gathering complementary resources, diversity of partners is mentioned as an important condition for collaborative innovation as it brings together different resources (Siddiki et al., 2017). This study focuses on the selection and exclusion of actors and the activities that bring actors together to establish synergy.

3.2.3 Collaboration in different phases of the innovation process

Governments increasingly shift from single innovation projects to broad 'missions', which require all stakeholders' ownership to succeed (Mazzucato et al., 2019). Hence, the establishment of synergy throughout the entire innovation process has become more important. The establishment of synergy relates to at least two key phases in the innovation cycle: 1) the generation and selection of ideas, and 2) the implementation of the chosen idea (Sørensen & Torfing, 2011; Meijer, 2014; Keum & See, 2017). These two phases can be regarded as at least two different arenas of interaction and both have a clear outcome: a selected innovative idea and an implemented innovation (Koppenjan & Klijn, 2004:178; Hartley et al., 2013). A vital enabling process for synergy is therefore a metagovernor that sets up a collaborative arrangement that includes partners that bring the necessary resources to the table in both of the phases (Cramm et al., 2012). However, research that differentiates between these two phases concerning enabling synergy is scarce.

Concerning enabling synergy for idea generation - we will refer to projects in this phase as 'idea-oriented'-, collaboration is required to fully understand the problem and to arrive at a solution that is both effective and can count on sufficient support (Torfing, 2019). In this first phase of the innovation cycle, synergy is mainly based on non-financial resources, such as insights, opinions and knowledge (Bovaird &

Loeffler, 2016:164; Weiss et al., 2003; Corbin & Mittelmark, 2008). By exchanging these, the collaborative arrangement can develop innovative ideas that one could not develop on their own (Go Jefferies et al., 2021; Paulus et al., 2018; Davis & Thomas, 1993; Siddiki et al., 2017). Thus, literature suggests that the synergy of innovative idea generation is likely to be focused on pulling actors to the process for the convergence of different ideas to arrive at an innovative solution (Ansell, 2016:42). Moreover, ensuring the participation of relevant decision-making actors is seen as a success factor so that the innovations can be carried forward (Grotenbreg & Van Buuren, 2018; Touati & Maillet, 2018). It can thus be expected that coordinators especially aim to include actors who possess intangible resources such as insights, expertise and decision power, and arrangements are made aiming to circulate as much ideas as possible.

Furthermore, growing interdependencies in today's society mean that government organizations no longer possess all the resources at their disposal to actually implement the innovation (Diamond & Vangen, 2017; Torfing, 2019). Collective implementation requires actors to work together to collectively gather resources in order to realize the innovation (Cinar et al., 2021). Therefore, in addition to synergy regarding ideas, synergy regarding the resources to implement the innovation is associated with enabling synergy (Bommert, 2010; Loban et al., 2021; Cramm et al., 2012). For implementation, sufficient resources to implement the innovation should be brought together (Damanpour & Schneider, 2009; Cinar et al., 2021). These include mainly tangible resources such as financial means and production resources (Piening, 2011). It can thus be expected that network coordinators especially aim to include actors who possess tangible resources that facilitate implementation. Here, synergy occurs in the implementation phase; we will refer to these projects as 'implementation-oriented'. Innovation projects sometimes start in this phase. In that case, literature suggest that agreement for implementation is generally reached in an early phase, but actors still have to discover ways of working to come to synergy and complement each other in different aspects (Ansell, 2016:42). Following from these insights the following hypotheses are formulated:

H1: Coordinators arrange the collaborative arrangement in the idea generation/selection phase based on pulling actors to the process for combining intangible resources, such as insights, opinions, decision power, and knowledge.

H2: Coordinators arrange the collaborative arrangement in the implementation phase based on pulling actors to the process for their tangible resources, such as financial means and production resources.

3.3 Methodology

Eight cases with the aim of innovating through collaboration were examined. The cases (and the case episodes) were selected based on various criteria for inclusion and variation: (1) the cases entail arrangements involving public actors, and to the extent possible, also private actors and citizens; (2) all cases are situated in Belgium and initiated by the federal government or at least with the inclusion of a federal actor, and to the extent possible also other levels of government; (3) to avoid pro-innovation bias, we also included cases that did not materialize in innovations, or in which innovation processes were particularly difficult to manage; (4) other important criteria included comparability, originality, and accessibility of the cases.

Table 4 shows the main characteristics of the cases. The cases were all medium-sized collaborative arrangements consisting of approximately 12 actors each, which were formed for the creation of a public sector innovation. One of the main differences in the projects was whether the innovative idea still needed to be developed by generating different ideas or whether the coordinators already had a clear idea as to what needed to be implemented. This provided us with the possibility of obtaining a clear view of the strategies in the two types of projects: idea-oriented and implementation-oriented. In idea-oriented projects, the collaborative arrangement was set up in order to get to know the problem at hand and to select an innovative solution and thus, the collaborative process started in an earlier stage of the innovation process. Projects starting the collaborative innovation process in the implementation phase are referred to as implementation-oriented projects. An innovative idea was chosen already in these projects and collaboration started with the goal to jointly implement the chosen idea. Two cases, Mothers in Poverty and NISP, were a mix of the two phases. In the Mothers in Poverty case local actors joined the project, shortly discussed ideas, then implemented useful ideas coming from these meetings in their own organization, and gathered every month to share experience after which new ideas were gathered and so on. In NISP, the implementation of a new IT-tool was already decided, but attention was paid to the process of idea generation occurred to determine what the functionalities of this tool should be.

In this study, the choice was always made to examine an episode in which the actors came together to develop the specific innovation and ended with an end product; either being an innovative idea and/or the implementation of the innovation. A project was regarded a success when the project ended with actual implementation of the chosen innovative idea. The aim was to interview all relevant actors in the collaborative arrangement, including the network coordinator(s). In this study a coordinator is the person who is directly involved in the interactions in the collaboration and is responsible for the coordination of the 'day-to-day' management.

When we selected a case and episode, we determined together with the coordinator who the relevant actors in the collaborative arrangement were. To minimize memory errors, we only included actors that were actively involved and present at the majority of meetings. The data was triangulated by comparing interview responses to each other and to compare answers with formal documents provided by the coordinator. We followed-up on respondents when we ran into inconsistencies. As the interview data was collected in the scope of an inter-university research project with multiple researchers, we were able to examine eight cases and to conduct 84 one-hour long semi-structured interviews. For this particular study, the interviews with the coordinators were especially important as they revealed why and what strategies were used to come to a synergetic process. The interviews with the other respondents allowed us to examine what resources they brought to the process, why they participated in the process and how they experienced it.

	Type of innovation	**Description**	**Orientation**	**Resulted in innovation?**
CareLab	Process innovation	Project concerning the simplification of rules and bureaucracy for parents with a disabled child.	Idea-oriented	No
Sustainability program	Policy innovation	Development of a set of actions the federal administration should implement to reach (inter)national sustainability objectives.	Idea-oriented	No

	Type of innovation	Description	Orientation	Resulted in innovation?
Connecting Healthcare	Technological innovation	Development of online tool that ensures (among others) that hospitals, general practitioners and pharmacies have easy online access to information about their patient's social rights.	Idea-oriented	Yes
Mothers in poverty	Service innovation	Developing and executing a procedure for the intense guidance of groups of 15 single mothers in poverty during one year.	Mix	Yes
National Information Sharing Platform (NISP)	Technological innovation	Implementation of ICT tool to unify and professionalize crisis management and emergency planning practices throughout Belgium.	Mix, but focus on implementation	Yes
Invasive Species	Process innovation	Implementation of a new institutional arrangement at the federal level that organize and formalize information exchange between institutions dealing with invasive species policies across regions and communities.	Implementation-oriented	Yes
City on scheme	Process innovation	Implementation of an innovative, collaborative campaign for awareness of a medication scheme.	Implementation-oriented	Yes

	Type of innovation	Description	Orientation	Resulted in innovation?
Radicalization	Process innovation	Implementation of a plan to streamline communication between government services to detect signs of radicalization in an early phase.	Implementation-oriented	Yes

Table 4. Studied cases

In order to conduct the interviews a questionnaire (see the appendix at the end of the chapter) and a standardized data collection protocol were developed. For this study the questionnaire included questions concerning the (a) applied metagovernance strategies and (b) questions on synergy and network interactions. We rather looked at synergy as a process, than to look at the established synergy as an outcome only (Jones & Barry, 2011). Therefore projects did not have to be successful in order to be synergetic. This way it was possible to get a rich understanding on the strategies that were applied during the process, how and with what aim actors were involved, and how this contributed to a synergetic process.

Four researchers conducted these interviews (the author of this chapter interviewed actors from three cases, two researchers interviewed the actors from two cases, and one researcher conducted the interviews for one case). The researchers worked together on the same research project and organized weekly meetings to jointly prepare the case selection, questionnaire and data collection. Hence, they got a large mutual understanding of the subjects at hand. At the start of the data collection, some interviews were conducted by two researchers to align the interview styles and to make sure that questions were posed in the correct way and that respondents were given the same milieu in which to answer. Lastly, the research team stayed in close contact with each other during the data collection and analyzing phase to reflect on the cases and to ask for clarification if needed.

Interviews were transcribed and analyzed on the main topics of this study. Metagovernance strategies were analyzed using the framework of Klijn and colleagues (Klijn et al., 2010) that differentiates between strategies regarding arranging the collaborative arrangement, introduction of process rules, strategies

to connect actors, and strategies to explore content. Synergy was analyzed as being both a process and an outcome (Jones & Barry, 2011). Hence, answers were analyzed by looking at the perception of having an effective outcome, but also at complementarity of resources, actor relationships, shared problem understanding et cetera.

3.4 Results

Two arenas of interaction were examined. Firstly, the one related to the *network formation for synergy concerning idea generation*, and secondly *network formation for synergy for implementation*.

3.4.1 Composing the collaborative arrangement for idea generation

Five projects that still (partly) had to develop the final innovative idea - referred to as 'idea-oriented projects' as their process was still very open-ended and no final innovative idea was selected - were studied. Concerning network formation in these projects, coordinators usually created the collaborative arrangement from scratch based on the actors who could have different insights at the problem at hand. In four of these projects, -CareLab, Connecting Healthcare, Mothers in Poverty and NISP- coordinators composed a collaborative arrangement (partly) from scratch based on the expertise of the actors/end-users, and whose insights into the problems at hand needed to be taken into account. For example, in the Connecting Healthcare case, it was necessary to search for hospitals and to include them because of their expertise in the matter, whereas in the CareLab case, parents were involved for including insights of the innovation's target audience. The starting point of the composition of the network in all four of these projects was the coordinator's own professional network. Coordinators asked their own professional network who they thought needed to be included in the process to capture all the different views towards the issue at hand and to come to innovative ideas. Sometimes actors from this own professional network were included in the process, other times only the suggested actors were invited. From there, a snowballing-effect happened in which participating actors proposed and invited other actors to the project.

In the idea-oriented projects almost everyone who was interested in the innovation project was allowed to join, especially when the innovation affected actors outside the governmental environment in the case of policy and process innovations. In those projects end-users were very much welcomed to join and coordinators

actively reached out to actors who had to deal with the problem at hand, for example by a call to participate in newsletters or by asking already involved actors whether they knew other potentially interested actors. However, coordinators were not willing to impose any rules on the actors for exiting the project as it could deter actors from joining the process. To help generate ideas, coordinators hardly imposed process rules on the actors in these networks.

Coordinators were generally pleased if actors wanted to invest their time in the process and to share their ideas and perspectives. This was especially the case in projects in which end users/citizens of the eventual innovation were included. In two of these idea-oriented projects, these were citizens who were present at the meetings because they were confronted with the problem at hand in their daily lives and invested their spare time in the project. Coordinators said they valued the input of these actors and did not want to impose any rules on them. For example, CareLab was characterized by including many different actors to generate ideas. The coordinators started the process as a thinking exercise to find an innovative solution for a problem and stimulated local actors to contribute as much as possible. Every actor who wanted to contribute was invited to join the process, and they could not be forced to stay in the process.

In the stage of idea generation, rules to join and exit the process were only imposed by the coordinator in projects concerning internal government affairs (such as the Sustainability program and NISP). The coordinator had little influence on the composition of those collaborative arrangements as idea generation happened in either an already fixed network that used to collaborate in the past for other projects and/or participation in the project was based on the legal objective of the actors as they were responsible for the policy issue at hand. Rules for joining and exiting the process were not imposed by the coordinator, but followed from the institutional context in which the actors operated. Some actors just needed to be there because of their organizational task. Additionally, the NISP project included a private IT developer in the project as specialist knowledge was required. The coordinator had little influence on the inclusion of this actor as the developer was selected through a public procurement procedure.

As expected, collaborative arrangements in idea-oriented projects were mainly created for the purpose of idea generation and actors were thus selected on the basis of their knowledge, insights and expertise (the intangible resources). Large plenary meetings were organized to generate as much ideas as possible.

Coordinators hardly paid attention to the actual implementation phase that would follow later. Hence, practical resources such as production resources was not (yet) a reason to include actors. Moreover, little attention was paid to including actors that could block the process, leading to failure to implement the chosen innovative ideas in the Sustainability program, as the selected innovative ideas did not acquire broad support of politicians and was not implemented. Hence, coordinators generally did not anticipate on later stages of the innovation process, except in the 'mixed' projects which were goal-seeking and implementation oriented at the same time.

	Orientation	**Network formation for idea generation**
CareLab	Idea-oriented	Network formation from scratch. Personal network coordinator and 'snowballing' in local community
Sustainability program	Idea-oriented	Existing network based on legal statute/organizational task
Connecting healthcare	Idea-oriented	Network formation from scratch based on personal network coordinator and 'snowballing'
Mothers in poverty	Mix	Network formation from scratch. Interested actors could apply to join
NISP	Mix	Network formation from scratch, public procurement procedure for IT developer, idea generation open to anyone who needed to work with the new IT tool. Some actors worked together already in the past
Invasive Species	Implementation-oriented	No joint idea generation
City on scheme	Implementation-oriented	No joint idea generation
Radicalization	Implementation-oriented	No joint idea generation

Table 5. Network formation for idea generation

3.4.2 Composing the collaborative arrangement for implementation

The transition from idea generation to implementation opens up a new arena of interaction and thus actors leave and join the process (Koppenjan and Klijn, 2010). First, the way the 'idea-oriented' projects coped with this transition is discussed. One of the largest bottlenecks in cases that were idea-oriented occurred in the transition from idea generation and selection to implementation. Moving beyond this phase turned out to be hard for some projects, because shifting from generating

ideas to actual implementation required actors to take on different roles. Actors were not only there to think along once in a while, but were now expected to invest practical, tangible resources, such as financial means or organizational staff. In other words, synergy based on different insights and other intangible resources had to change to synergy based on implementation resources.

Coordinators experienced difficulties as actors who were mainly included in the process to think along were now expected to help with implementation. Current actors did either not have the resources to implement the innovation (for example, citizens in CareLab who only wanted to think along and could not invest money or more time into the project) or actors who blocked the process were not included in this phase (Sustainability program). In sum, actors for idea generation were hardly selected with eventual implementation of the innovative idea in mind. Coordinators either had to include new actors in the process or needed to strengthen the commitment towards the innovation, so actors would be willing to invest practical resources for implementation into the project.

	Orientation	**Network formation for implementation**
CareLab	Idea-oriented	Trying to add actors with practical resources. Implementation failed
Sustainability program	Idea-oriented	No implementation occurred
Connecting healthcare	Idea-oriented	Trying to add actors with practical resources
Mothers in poverty	Mix	Same actors
NISP	Mix	Same actors
Invasive Species	Implementation-oriented	Existing network based on legal statute
City on scheme	Implementation-oriented	Small core group knew each other. Surrounding local network was created for this innovation. Actors only allowed to join when they wanted to invest resources
Radicalization	Implementation-oriented	Existing network based on legal statute

Table 6. Network formation for implementation

Implementation-oriented projects almost did not have to cope with the transition from idea generation to implementation. Coordinators of these implementation-

oriented project hardly created a collaborative arrangement based on complementary insights for idea generation. Coordinators led the collaborative arrangement towards an already known end product, that was developed by a ministry (Radicalization), the coordinator herself (City on Scheme) or politicians (Invasive Species). Hence, it can be argued that these projects skipped the collective idea generation phase to determine the end product and had a different starting point. The coordinator's role in enabling synergy for implementation is more modest when it comes to composing the network. In the majority of cases existing networks were used to develop the innovation, the legal statute of the organization required that the organization was involved, or some public organizations had to cooperate because the innovation belonged to the portfolio of their political superior. Thus, coordinators hardly formed networks from scratch with the goal to combine different resources. In three cases of the implementation-oriented projects it was already largely determined who was going to work together, simply because the innovation was part of the policy domain of the involved actors and actors had to participate because of their (legal or political) responsibility towards the problem at hand. Hence, the innovation project did not start by a coordinator selecting actors based on their different perceptions and resources, but collaboration was based on the formal task of the organization. The composition was the collaborative arrangement was a matter of hands-off institutional design with little influence of the day-to-day hands-on coordinator. However, the coordinator did include other actors in all cases that reached the implementation phase. These actors were selected based on whether they could block the process and if they were absolutely necessary for implementing the idea that was already known up front. Therefore, these projects contained the actors who could implement the innovation quickly and were from the start of the process aware that they had to invest resources in the project. Hence, to create synergy for implementation, actors were selected on a less open-ended basis. Actors participating in this process had to actually contribute something to the implementation, otherwise they were not admitted to the process. On the one hand, this was because they had to be there because of their statute, but in one case (City on Scheme) it was a rule set by the coordinator.

Complementarity of resources was based on both intangible and tangible resources. Synergy of financial resources was not necessary to create because a predefined (legal) allocation key had often already been agreed upon and was either based on the legal task of the organization or the (home organization of the) coordinator ensured sufficient financial means. Actors who voluntarily joined the

process were never asked to provide financial resources. Recombining resources was less of a group process that included all actors. Instead, subgroups were regularly created by the coordinator to combine resources. Instead of bringing together a diverse set of actors to explore ideas in a plenary meeting, subgroups were characterized by sort-like actors with a same background (for example legal advisors from different organizations in the Invasive Species cases) to make a plan to implement the chosen idea and to share specialist knowledge. Hence, the coordinator applied connecting strategies to connect actors with complementary resources to each other, and did not focus on large plenary meetings to explore all possible ideas.

3.5 Discussion and conclusion

Synergy is often described as a crucial part for successful network outcomes and is enabled through an interplay of various different determinants, such as the combination of resources (Weiss et al., 2003; Ansell & Torfing, 2014:11). For that reason, this study examined network formation for the combination of resources with the goal of increasing the power of these resources by combining them (Gray & Ren, 2014:127). More specific, how coordinators compose collaborative arrangements aimed at public sector innovation to establish synergy concerning idea generation and implementation.

It was hypothesized that coordinators of idea-oriented projects try to establish a synergetic process by composing the collaborative arrangement by pulling actors to the process to combine intangible resources, such as insights, opinions, and knowledge (Hartley et al., 2013). This hypothesis can be partly confirmed and is in line with the prevailing idea in the literature that collaboration with a diverse set of actors is an important enabler for both synergy and innovation (Corbin et al., 2018; Siddiki et al., 2017; Ansell & Torfing, 2014). However, it was found that actors who could block the process or help the process forward were not included.

Next, it was hypothesized that coordinators of implementation-oriented projects try to establish a synergetic process by arranging the collaborative arrangement based on pulling actors to the process for their tangible resources, such as financial means and production resources. This second hypothesis can also only partly be confirmed. It was found that coordinators in implementation-oriented projects had limited influence on the composition of the collaborative arrangement. Although they could adjust the composition of the network, the composition of the collaborative arrangement was not entirely driven by the desire to create a

synergetic process among all actors, but rather 'to get things done' for example, by having frequent one-on-one contact with certain actors. It was found that actors were indeed attracted for their tangible resources in the implementation-oriented projects, but also to some extent intangible resources. Interestingly, collaborating to combine financial means was never a main goal to invite actors because sufficient financial means were already available before the collaboration started.

Idea generation/selection phase	**Implementation phase**
Focus on intangible resources to create a synergetic process by combining as many insights as possible. Coordinator's main strategies: • Pulling actors to the process from own network and/or 'snowballing'. • Limited entrance and exit rules to make process easy accessible. • Limited commitment of actors required to make participation appealing. • Limited focus on actors who can block the process or help the process forward.	Focus on both tangible and intangible resources to implement the innovation. Coordinator's main strategies: • Minimal arranging strategies as push factors drive actors to collaborative arrangement (e.g. task of the organization) • Entrance rules mostly based on legal statute and (non-financial) resources. • Less focused on collective synergetic process, more focused on one-on-one or small group interactions to 'get things done' and to direct actors to the end goal. • Focus on actors who can block the process or help the process forward.

Table 7. Summarized results

This study is one of the firsts to empirically apply the concept of synergy in the context of public sector innovations and that differentiates between different phases of the process (Lasker et al., 2001; Corwin et al., 2012; Cramm et al., 2012; Loban et al., 2021). It is the one of the first studies that shows, by examining eight cases, how a clear distinction between phases leads to a different way of arranging collaborative arrangements in public sector innovation projects and how this affects the way synergy is established. Moreover, being one of the first studies to make the distinction between idea-oriented and implementation-oriented projects, an interesting tension is uncovered (Hartley et al., 2013). The findings show that

idea-oriented projects are aimed at having synergy by pulling actors to the process and combining intangible resources in the first stage of the innovation process, which is beneficial for a synergetic process in which innovative ideas can be developed (Loban et al., 2021). However, the coordinators' decision to freely add actors without expecting real obligations during idea generation turned out to be a crucial bottleneck and even led to no implemented synergetic outcomes (Weiss et al., 2003). This is in line with research arguing that actors who are pulled to the collaborative arrangement to search for synergy are more likely to enjoy early agreement on general goals, but can face difficulties when concrete agendas for implementation are set (Ansell, 2016).

In contrast, concerning implementation-oriented projects, it was found that the coordinator often only has limited influence on the composition for the implementation of the innovations and that creation of as much synergy as possible is not always the main goal of the collaboration. One can argue whether the implemented solution is very innovative and deals with the problem at hand as we found that coordinators often have to act within a certain collaborative arrangement of fixed actors and no shared idea generation took place. Hence, only a limited synergetic process could be established (Jones & Barry, 2011). Coordinators of these collaborative arrangements must apply other coordinating strategies in order to create as much synergy as possible within the group of fixed actors (Klijn et al., 2020; Agger & Sørensen, 2018).

These findings are therefore valuable for practitioners as they indicate that coordinators should preferably go back-and-forth between idea generation and implementation for the optimal innovative result. The projects which are referred to as 'mix between idea orientation and implementation' handled this well as attention was paid to the eventual implementation phase already when generating ideas. This means that actors that are absolutely necessary for implementation should already be attracted in the idea generation phase. Contrary, the coordinator in implementation-oriented projects should not be blind to perceptions of actors who cannot actively contribute to implementation but can still provide valuable ideas for the end product. Thus, the coordinator should have the ability to divert from the initial idea. The projects which are referred to as mix between goal-seeking and implementation seem to be a good example of this strategy.

Future research could focus on the interactions in the collaborative arrangements once they have been established. With this study, light was shed on the way actors

are brought together, but not how actors are ideally integrated in the collaborative arrangement and how they best interact with each other. Future research can examine how actors should ideally interact with each other (such as the type of network structure) once they have been brought together to have the most effective (innovative) outcomes and how that relates to the resources of these actors and/or the phase in the innovation process. Moreover, the findings suggest that the type of innovation might be of influence on the way coordinators are able to arrange the collaborative arrangement. Future research should differentiate more between the different types of innovation and metagovernance strategies.

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Appendix chapter 3

Interview protocol

Introduction

1. Can you briefly introduce yourself?

2. What was your role in the project?

3. What is your job within your own organization?

Network and synergy

4. Did you have any expectations regarding the innovation? Have your expectations been met? Why (not)?

5. To what extent do you support the outcome of the collaborative process?

6. How and why were you involved in the collaborative process?

7. Next to information, which resources did you share with which actor to support the process in the collaborative arrangement ? (think of financial resources, staff time, working time, support in terms of communication platforms or access to service delivery platforms, research and analytical tools)

8. With which actors have you worked before?

9. With whom did you interact most frequently? Why?

10. Who were the most important actors? Why were they the most important actors?

Metagovernance strategies

11. Have some measures been taken to create a process to come to successful collaboration between actors? Which ones?

12. Do you feel that they contributed to a better relationship with the other actors?

13. Do you feel that they contributed to a more effective process in terms of developing new ideas, selecting ideas, implementation, or diffusion?

14. In what way? (e.g. better communication, more trust, shared problems understanding)

Chapter 4

It is all about interaction: Network structure, actor importance and the relation with innovative outcomes

ABSTRACT

When collaborating for public sector innovation, some actors are found to be more important than others to be included in the collaborative process. This chapter examines how innovative outcomes of collaborative public sector innovation projects can be explained by the network integration of its most important actors. Using social network data of three cases that aimed to develop and implement a public sector innovation it was found that actors of successful cases are better connected with each other through clique overlap when they interact outside official meetings. Moreover, the most important actors are more dispersed throughout the network in successful cases and connect the entire network with each other. This observation is only to a limited extent also found for interaction during official meetings.

Keywords: innovation, collaboration, network structure, actor importance, cliques

4.1 Introduction

In recent years, many governments have been establishing collaborative arrangements to develop public sector innovations to cope with today's societal problems (Lopes & Farias, 2020; Torfing, 2019; Hartley et al., 2013). Public sector innovation entails the development and implementation of new public policies, services, technologies and administrative processes that represent a qualitative change from how things were done before (De Vries et al., 2016; Gieske et al., 2019). Although working in inter-organizational collaborative arrangements is not a new phenomenon, public sector innovations have been increasingly developed in collaborative arrangements in recent years. New opportunities to interact have arisen in the past decades, such as digital tools that allow interaction with actors that would otherwise be left out of the innovation process (Castells, 2000; Geuijen et al., 2017). But also, increasing fragmentation of society and the subsequent interdependencies between actors have led to a need for inter-organizational

collaboration (Bommert, 2010; Agger & Lund, 2017). A concept closely related to interdependencies in inter-organizational collaboration is that of actor importance (Koppenjan & Klijn, 2004:178; Meijer, 2014). Stevens (2018) is one of the few scholars who examined actor importance in collaborative arrangements aimed at innovation in relation to network structure. He found that individual actors are in some cases more likely to interact with actors they find 'very necessary' to tackle the policy problem.

Recently, considerable research has examined the relation between network structure and network effectiveness (e.g. Raab et al., 2015; Stevens, 2018; Cepiku et al., 2020). Research suggests that network structure can positively influence the outcomes of the collaboration. For example, a high degree of network-level connectedness allows information to flow efficiently through the network and is associated with the development of social capital and trust (Hu et al., 2022; Bodin et al., 2017; Yi, 2018).

Clique overlap is named as the most effective way type of network integration by milestone studies such as those by Provan and Milward (1995) and Provan and Sebastian (1998). A clique is a group of at least three actors who are directly connected with each other. Cliques overlap when an actor is a member of multiple cliques and thus connects multiple cliques with each other. When clique overlap occurs, actors in the network are more closely connected to each other, while superfluous ties between actors are reduced. Remarkably, little attention has been paid to how innovative outcomes can be explained by the integration through clique overlap of the most important actors. While the inclusion of important actors who are necessary for the realization of the innovation is at the basis of collaborative innovation (Torfing, 2019), little is known about the extent to which the integration of important actors in collaborative arrangements results in innovative outcomes.

Therefore, this study answers the following research question:

How can innovative outcomes of collaborative public sector innovation projects be explained by the network integration of its most important actors ?

The question is answered by examining three cases in which a collaborative arrangement was established in order to create better digital information exchange in the public sector. For each of these cases, the degree of clique formation and clique overlap and the resulting network integration of the most important actors

are examined in two interaction networks: interaction outside meetings and interaction during meetings.

4.2 Theoretical framework

4.2.1 Collaborative innovation and the importance of actors

Governments increasingly turn to the development of public sector innovations as a way to deal with wicked problems that arise from a complex, fragmented society, unpredictable events, and increasing citizens' demands for public services (Ansell et al., 2021; Lopes & Farias, 2020; Torfing, 2019; Wegrich, 2019). Although research on innovation has gained increasing attention, no clear consensus on the definition of the concept is present. Following from the literature review by De Vries and colleagues (2016) definitions of public sector innovation commonly emphasize innovations as being something new within a given context. This can be a new or changed service, but also a new policy, technology or process. This novelty might exist somewhere else, but is new in its context and represents a change and discontinuity with how things were done before (Damanpour et al., 2009; Osborne & Brown, 2011; Gieske et al., 2019). Innovation is, therefore, something different from optimization in the sense that innovation represents a break with the past and concerns the implementation of something new in the context. Optimization is, on the other hand, an improvement of existing routines in line with the past. In recent studies one additional characteristic of public innovation is commonly acknowledged. Unlike private sector innovation which is driven by competitive advantage over others, public sector innovation is specifically aimed at the creation of public value instead. The innovation aims to solve a societal problem and adds value to society in that way (Crosby et al., 2017; Chen et al., 2020).

As all necessary resources for the development of innovations are usually not available within one single government organization, governments increasingly develop public sector innovations in collaborative arrangements (Bommert, 2010; Torfing, 2019). In these collaborative arrangements resources such as knowledge, financial means, and production resources are combined to develop an innovation to cope with the problem at hand. Still, mere bringing actors together does not result in innovations. Several factors are closely linked to the process between collaboration on the one hand and the creation of innovation on the other hand.

Among them are:

1) The inclusion of the necessary actors in the collaborative arrangement and their importance (Siddiki et al., 2017; Godenhjelm & Johanson, 2018; Ansell & Torfing, 2014:11). For example, actors with knowledge, financial means, decision-making power et cetera.

2) The interactions among these actors (Agger & Sørensen, 2018; Lewis et al., 2018; Lopes & Farias, 2020). For example, interaction among people with different insights or knowledge allows actors to learn and spurs the generating of new ideas (Voorberg et al., 2017; Koebele, 2019).

4.2.2 Actor inclusion, importance and interaction

Concerning the inclusion of actors, actors are included for different reasons in the innovation process (Godenhjelm & Johanson, 2018). These can be the resources these actors can bring to the process, such as different insights or financial resources (see e.g. resource dependency theory; Scharpf, 1978; Pfeffer & Salancik, 1978; Hillman et al., 2009), the coordinating role the actor fulfils, their decision-making power, or simply because they are interested in the problem at hand and want to think along (Koppenjan & Klijn, 2004:178). Actors become more important as the substitutability of, for example, their knowledge or decision-making power are low. Therefore, a low substitutability of necessary resources are a basis of power in collaborative arrangements aimed at innovation, and thus can make certain actors more important than others.

Next, the premise of collaborative innovation is to interact with each other in order to combine different resources and perspectives, to learn from each other and subsequently implement the innovation (Ansell & Torfing, 2014:11). Information sharing is crucial for the development of innovations (Koliba et al.,2017). During meetings, because actors need to build upon each other's ideas to deepen discussions, to come to a synergetic process and to learn from each other. Outside meetings, information sharing is necessary to elaborate on the things discussed during official meetings, working out details etc.

The structure of the interaction in these collaborative arrangements (also referred to as networks) can take many forms and shapes. Network characteristics such as the density, centrality of individual actors, and structural holes reflect the shape of the network, and thus the interaction patterns within the collaborative

arrangements (Lusher et al., 2012:7). Individuals gain access to information, social support, and other resources through the ties with other actors (Hu et al., 2022, Bodin et al., 2017; Yi, 2018; Agneessens & Wittek, 2012). Moreover, research suggest that central actors are more likely to access useful knowledge from others and therefore becoming more important (Tsai, 2001; Zhao, 2022). They are the 'spiders in the web'. Hence, the causal relation between importance and network integration is somewhat unclear as importance might not only be attributed to actor specific characteristics such as the possession of resources, but also to an actor's central network position.

Milestone studies in the relation between network structure and network outcomes are the studies of Provan and Milward (1995) and Provan and Sebastian (1998), who provided a framework for the determinants of effective network outcomes; one of them being the integration of actors in the network. Three types of integration are commonly distinguished in the inter-organizational network literature: First, density-based integration, which is the type of integration based on the total level of ties among the actors in the network (Scott, 2000:69). In this type of integration the observed number of ties between the actors is compared to the maximum number of ties. A higher density resembles a higher degree of network integration. A second type of integration is centralized integration, which is the extent to which the network ties are organized around particular focal actors (Borgatti et al., 2013:149). The third type of commonly distinguished types of integration is clique overlap (Borgatti et al., 2013:184; Raab, et al., 2015). Cliques are a minimum of three different actors who are directly connected to each other in a network. When actors are a member of multiple cliques it results in clique overlap. In the case of clique overlap an actor connects multiple cliques with each other and thus indirectly connects actors who are not in the same clique.

The discussion has focused on what kind of integration is best for effective network outcomes and is commonly focused on the balance between density-based integration and centralized integration (Provan & Sebastian,1998; Turrini et al., 2010; Saz-Carranza & Ospina, 2011; Ngamassi et al., 2014). Several studies found that centralized integration organized around a central coordinator is positively associated with network outcomes (Provan & Milward 1995; Raab et al., 2015; Cristofoli & Markovic, 2016). Free-wheeling behavior in the network can be prevented as the central coordinator is able to control and monitor the behavior of all the other actors, especially in sparsely connected networks (Cristofoli et al., 2021).

However, in this chapter the integration through clique overlap is examined. This type of integration is found to combine the advantages of strong density-based integration and strong centrality-based integration and enhances the overall network outcomes, but is very overlooked in current literature (Provan & Sebastian, 1998). The membership of a clique in the network has been linked to several benefits, such as a higher pace of information sharing through the network and facilitation of learning (Provan & Sebastian, 1998). It was found that network outcomes are evaluated more positively when cliques overlap each other, but less positively when too much actors in the network are connected to each other. Having clique overlap is effective because members who are in several cliques are brokers and thus connect different cliques to each other. In this structure, not everyone in the network needs to be directly connected to each other because information is transferred through the actors that are members of multiple cliques. Moreover, while a certain amount of dispersion of important actors throughout the network seems needed, (complete) separation of certain actors is found to be detrimental for successful outcomes (Yi, 2018). Stevens (2018) examined how actor importance determines interaction in collaborative innovation networks that work towards a joint outcome and found that actors are in some cases more likely to interact with actors they find 'very necessary' to tackle the policy problem. This suggests that actors who find each other important tend to stick to each other. A core group of important actors that mainly directly interacts with each other without interacting with others in the network would be an obstacle to the development of innovations (Provan & Kenis, 2008).

From these previous findings we expect that cases with successful innovative outcomes are characterized by a high degree of clique overlap in terms of the most important actors being included in multiple cliques, both during and outside meetings.

4.3 Methodology

4.3.1 Cases and data collection

Three Belgian cases were examined in which a collaborative arrangement was created with the goal to implement a public sector innovation. These innovations aimed to create a better digital information exchange between the key players involved in the policy field at hand. They all focus on a more effective way to cope with information needs by transforming information systems in order to work more effectively. They are clear examples of the line of reasoning that effective

information sharing systems are a lynch pin in critical public policy areas to be effective and that government must embrace the digital era to optimize inter-organizational information integration (Pardo and Tayi, 2007; Meijer and Bekkers, 2015)

All actors in the network were asked to participate in a survey that asked about their interactions with, and their perception on the importance of the other actors[5]. The cases were selected based on the following criteria: (1) The cases entail arrangements involving public actors and to the extent possible also private actors and citizens; (2) In order to avoid the pro-innovation bias we included also cases which did not materialize in innovations, or in which innovation processes were particularly difficult in their progress; (3) Comparability in terms of network size, goal of the innovation and accessibility were important criteria as well.

CareLab was a project initiated by the Belgian federal government focusing on the simplification of rules and bureaucracy for parents with a disabled child. A core group of 18 actors, such as health professionals, civil servants and parents could be identified. The project ended with the idea selection of four innovations, including a digital government tool to reduce the administrative burden for parents with a disabled child, and a first step towards implementation. After that, core actors left the process and sustainable implementation of these solutions did not take place.

Invasive species was a project to generate a more comprehensive and effective policy on invasive species by creating a new institutional arrangement that organizes and formalizes digital information exchange between institutions dealing with invasive species policies across Belgian regions and communities. A core group of 11 actors could be identified. These included federal and regional policy officers, scientists, and legal experts.

Radicalization was a process innovation with the goal to change the digital information exchange procedure concerning signs of radicalization within the group of asylum seekers or refugees to ensure that the transfer of information on radicalism is effective, both horizontally and vertically. A new (digital) notification procedure to detect radicalization and the new way of information exchange was implemented. A core group of ten actors, such as representatives of the Federal

[5] Data was collected in the period March 2017-June 2018.

Agency for the Reception of Asylum Seekers and the General Intelligence and Security Service could be identified.

4.3.2 Interaction

Two types of interaction networks were studied in each case. To capture interaction in the collaborative arrangement outside official meetings the network of information sharing *outside official meetings* was examined. Moreover, the network concerning elaboration upon others' ideas *during official meetings* was examined to determine which actors interact with each other during meetings. These networks are referred to as *interaction outside meetings* and *interaction during meetings* in this chapter.

To map the interactions outside formal meetings, the following question was asked:

- *Could you please indicate to whom you gave and from whom you received information, after and outside of formal meetings? "Information" includes reports, statistics, advice, and remarks. This information can be both verbal and written.*

A tie between actors was only considered when it was confirmed from both sides. For example, if actor 'i' claimed that he gave information to actor 'j', it was only regarded a tie when actor 'j' indicated that he received information from actor 'i'. When this was not possible due to missing network data because an actor did not fill out the survey (CareLab: 2 actors, Invasive Species: 2 actors, Radicalization: 1 actor), a tie was considered by confirmation from only one respondent.

To determine the interaction *during meetings*, respondents were asked:

- *Which participants in [project name] most frequently elaborated during the meetings of [the arrangement] upon the information and ideas you shared?*

For this question, respondents could indicate the five participants that elaborated most frequently on their contributions inside the meetings. Because CareLab consisted of more actors, the respondents could name up to eight actors in this case to make the networks comparable. That way respondents could name around 50 per cent of the actors in all cases. This question was posed in a way that respondents were not able to name every actor in the collaborative arrangement. As the collaborative arrangements consisted of relatively few actors we were only

interested in the actors who elaborated most on an actor's contributions. The meetings in the cases were set-up in a way that all actors engaged in group discussions with each other. By limiting the amount of actors we prevented respondents from naming every actor in the collaborative arrangement.

4.3.3 Actor importance

Respondents were asked to evaluate how important they perceived the other actors in order for the innovation process to succeed. They were asked to answer the question:

- *Could you please indicate for each of the participating actors whether you considered it 'very important', 'important' or 'not that important' that they were involved in the process.*

Only the 'very important' answer category was taken into account as respondents were not likely to indicate actors as 'being unimportant for the process'. By only including the 'very important' category, a clear view of the actors respondents felt were the most important could be obtained, as it eliminated the rather neutral 'important' category, and, thus, giving a better representation of the most important actors.

The importance of the individual actors in the networks was determined by calculating the percentage of the times they were labelled as being 'very important' by the other actors. For example, in CareLab, the total number of times an actor was reported to be 'very important' to the process was divided by the total number of actors minus three (as actors cannot indicate themselves as being very important and the presence of two non-respondents in this case).

4.3.4 Network integration

Multiple measures were used to determine the level of integration of each network. As a basic variable, the density of the networks was checked to see how the actors in the whole network are connected to each other. The density is the number of ties between actors compared to the maximum number of ties (Borgatti et al., 2013:183). Density is used as a measure of network integration, as is common in studies examining network structures (Provan & Sebastian, 1998; Ngamassi et al., 2014).

Next, the different cliques and clique overlap in the networks were examined. As mentioned, a clique is a subset of at least three actors in which every actor is adjacent to every actor in the subset, and it is impossible to add any more actors to this clique without violating this condition (Borgatti et al., 2013:183). Only reciprocal ties were taken into account, as this study centers on the clique formation of interactions. Cliques of interaction in which, for example, only one actor gives information and the other actors in the clique 'just' receive information were excluded. That way, only cliques in which all actors actively gave information to, and received information from, all other actors in the clique were taken into account. This principle was applied to both interaction networks.

With the examination of cliques it was possible to identify central actors, and/or whether (groups of) actors were totally isolated. Because the networks are relatively small, only cliques in which all actors of the clique were directly connected to each other were examined. Therefore, methods of analysis that 'loosen' the strict definition of a clique by allowing actors to be not necessarily connected to every other actor in the clique, such as N-clans (Harary et al., 1965) or K-plexes (Seidman & Foster, 1978) were not used. The cliques were identified using the UCINET software. With this software several key measures of network integration were obtained (Kegen, 2015):

- The number of cliques
- The clique density (the amount of actors in at least one clique)
- The average size of cliques
- The individual and average clique centrality. This is the absolute amount of cliques an individual actor is a member of and, at a network level, the average amount of cliques an actor is a member of.
- The integration of clusters of cliques. The cliques were analyzed using an average link hierarchical clustering procedure to see how cliques overlap with each other (Borgatti et. al, 2013:96). Average linkage hierarchical clustering is a stepwise procedure for determining the clusters in the network based on the average distance from any member of one clique to any member of the other cliques. The algorithm merges the closest pairs of cliques into a cluster. Then, the clique that is closest to this new cluster is, in turn merged with this cluster et cetera. This procedure is repeated until all cliques are merged into a single cluster. As high clique overlap in the network requires less stages of this so-called clustering, the lower the level (stages) of clustering, the higher the extent of clique overlap.

4.3.5 Innovative outcome measures

The innovative outcomes of the cases were determined in two ways. First, every respondent was asked to rate the innovative outcomes of the project on a scale ranging from 0 to 10 using four items[6]. Once data were collected, the results of the three cases were pooled and a factor analysis (principal components analysis) was executed to come to one broad measure of innovative outcomes. Second, to overcome a possible bias in the respondents' answers, the phase at which the project ended was determined based on interview data and official documents. The commonly used phases of the innovation cycle – idea generation, idea selection, implementation, and dissemination – were applied to the cases (Sørensen & Torfing, 2011).

4.4 Results

Concerning the innovative outcomes of the cases, the factor analysis indicated that items loaded on one factor and the scale was regarded as reliable (Cronbach's alpha = 0.733), the mean factor scores were then calculated to obtain comparable measurements per case (see also Provan & Sebastian, 1998). The results show that CareLab scores substantially lower on innovative outcomes than the other projects, with the negative factor score (-0.34) indicating that the project was ineffective in producing innovative outcomes. The process of the Invasive Species case (factor score: 0.20) and Radicalization case (factor score: 0.46) was much more successful in producing innovative outcomes. Concerning the end phase of the projects; as CareLab did not move past the idea selection phase, it is possible to say that this project was less successful than the other two cases as those reached the implementation phase.

[6] The four items were:

- No innovative ideas are developed [in this process] ….Many innovative ideas are developed [in this project];
- The innovative character of [the process] is lower than my initial expectations …. The innovative character of the [the process] exceeds my initial expectations;
- The innovative ideas that are developed in [project name] are not feasible at all …. The innovative ideas that are developed in [project name] are very feasible; and
- The [solutions that have been developed] do not deal with the problems at hand at all …. The [solutions that have been developed] truly deal with the problems at hand.

Case	Mean factor score	Phase reached
CareLab	-0.34 (highly negative)	Idea generation/selection
Invasive Species	0.20 (positive)	Idea selection/ Implementation
Radicalization	0.46 (highly positive)	Implementation

Table 8. Perceived innovative outcomes. Cronbach's alpha: 0.733

It was expected that cases with successful innovative outcomes are characterized by a high degree of clique overlap in terms of the most important actors being included in multiple cliques, both during and outside meetings. The remainder of this chapter presents the two types of networks separately. The networks are complementary to each other, but it makes more sense to look at each network separately as the interactions in the networks are different in nature. During meetings, actors build upon each other's ideas to deepen discussions and to come to a synergetic process. Outside meetings, actors can elaborate on the things discussed during official meeting and work out the details in smaller groups. By comparing the networks separately, it is easier to notice the differences between the cases per type of interaction network and therefore what the characteristics of a successful case are compared to a less successful case and how it is different per type of interaction network. Moreover, the networks are measured in different ways, which makes a separate presentation more suitable.

4.4.1 Interaction network 1: Interaction outside meetings

Table 9 shows the integration of the 'interaction outside meetings' networks. Comparing the interaction outside meetings network across the three cases, CareLab shows the lowest density, followed by the Invasive Species case, and Radicalization has the highest network density. This can partly be explained as the relative measure of density typically decreases when network size increases (Jansen, 2006:194). An actor is only able to have a direct tie with a limited number of other actors so when the network size increases, the relative number of linkages decreases. Larger network size is generally associated with a higher number of cliques, because there are simply more actors to connect to. This is visible in the network data as CareLab has one clique more than the successful Invasive Species and Radicalization networks. However, the clique density of the CareLab network can be considered quite low as just a little over half of the actors (10 out 18 actors) is integrated in at least one clique.

Clique density is a measure that indicates how many actors are a member of at least one clique. The clique density is lowest in the CareLab network, and higher in the smaller Invasive Species and Radicalization networks. This is in line with the argument that smaller networks have a higher clique density as isolated actors are spotted more easily and are consequently sooner squeezed into a clique (Kegen, 2015). Furthermore, the cliques in the CareLab network all contain the minimum number of three actors, while the other networks tend to have some cliques containing four actors, which gives these networks a higher average clique size pointing to a higher extent of integration.

	CareLab	**Invasive Species**	**Radicalization**
Network density	0.127	0.273	0.311
No. of cliques in network	6	5	5
Average clique size	3	3.4	3.2
Clique density	0.55	0.72	0.70
Average clique centrality	1	1.55	1.60
Individual clique centralities	0 to 6	0 to 3	0 to 5
Complete integration of cliques at level…	2	3	2
Top most important actors[7] (with individual clique centrality)	1 Local coordinator 1: 93% (clique centrality: 6) 2. Parent 1: 67% (0) 3. Private actor 5: 60% (1) 4. Federal coordinator: 60% (4)	1. Public actor 1 Federal: 50% (0) 2. Public actor 2 Flemish 38% (1) 3. Public actor 2 Walloon: 25% (2) 4. Public actor 1 Brussels: 25% (0)	1. Federal actor 4 (coordinator) 78% (5) 2. Federal actor 1 67% (3) 3. Federal actor 2 67% (2)

Table 9. Network integration 'interaction outside meetings' network

[7]Top three. In case of equal importance more actors are listed in the table.

Clique overlap

The clique centralities were obtained to spot indications of clique overlap. The clique centrality indicates the number of cliques an actor is a member of. Moreover, a hierarchical clustering procedure was executed to see to what extent cliques are integrated with each other. The average clique centrality of CareLab is 1, indicating that on average every actor is a member of one clique. However, as the clique density indicates, only 55 per cent of the actors are present in at least one clique. The average clique centrality turned out to be especially high because one actor is member of all six cliques and one is a member of four cliques. This indicates a high extent of clique overlap, but given the observation that only 55 per cent of the actors is included in a clique it means that especially a core group is well-connected to each other through clique overlap and the other actors are more isolated (eight of them are in no clique at all). In this network it indicates a strong centralization towards a core group that is closely tied together, while other actors are more isolated.

Actors in the more successful Invasive Species and Radicalization networks are less isolated. The average clique centralities indicate that actors are on average a member of 1.55 cliques (Invasive Species) and 1.60 cliques (Radicalization). An interesting observation in the Radicalization network is that one actor is present in all cliques in the network, indicating strong clique overlap through this central actor, just as in the CareLab network. Not surprisingly, this central actor is the coordinator.

However, although a central coordinator is present with whom actors are directly connected in the Radicalization network, the observation that a higher percentage of actors in the network are a member of at least one clique (70 per cent) indicates a high degree of interconnectedness of the other actors as well. Therefore, in this network actors interact frequently with the coordinator, but unlike CareLab, they also interact with the other actors.

In the Invasive Species network, none of the actors are a member of every clique, meaning that no central actor connects all cliques with each other. In this network 72 per cent of the actors are in either one, two or three of the five different cliques. Not having a central actor that connects all cliques implies less clique overlap, which is also confirmed by the lowest level of clique integration following from the hierarchical clustering procedure. However, as only 28% percent of actors are in no clique at all and cliques are on average larger, we are able to say that actors are

more directly connected to each other than in CareLab where interaction concentrates towards a well-connected core group.

Actor importance

Then, concerning actor importance, especially the CareLab and Radicalization cases have actors who are regarded to be very important to the process by the vast majority of the collaborative arrangement. The most important actor in these cases are coordinators and are a member of all cliques in the 'interaction outside meeting' network, indicating that the most important actor in the network is well-integrated in the cliques in these 'interaction outside meetings' networks. However, the other most important actors in the CareLab network, not being coordinators, are less well-integrated in the network. These important actors are in only one or even none of the cliques. The important actors in the Radicalization case are in that respect better integrated in the network as they are all a member of multiple cliques. Interestingly, actors in the Invasive Species case tend to qualify other actors in the network less frequently as being very important to the process. The most important actor is only named 'very important' by half of the other actors. Also, the most important actors in this case are poorly integrated into cliques. Especially less important actors are well-integrated in the clique structure of the network.

Following from these findings it can be concluded that the CareLab network has the lowest level of integration on the whole network level with a core group of actors that interact with each other, while other actors, including some of the most important ones, are in the periphery of the network and hardly share information with each other outside meetings. The cliques overlap to a high extent, but only a few actors are present in these cliques, making the actors who are a member of a clique well-connected with each other, but poorly with the rest of the (sometimes highly important regarded) actors. This points to a very important regarded 'in-group', that mainly shares information with each other, while the other less important actors hardly interact with each other.

Clique overlap is lower in the Invasive Species network, but as more actors are present in at least one clique, the integration of the whole network of Invasive Species is higher. Also, important actors are more dispersed throughout the network; none of the important actors are present in all cliques, which means that the important actors have a less prominent role in this network.

The Radicalization network shows a high level of integration as a majority of actors are included in a clique and this network has a high level of clique overlap. Because a vast majority of actors are a member of a clique and cliques overlap to a high extent, the whole network is tightly connected. Especially the most important actors are well-integrated in the network having a membership of multiple cliques, which means that important actors are at the core of the network, yet they are better connected to the others in the network unlike what we see in the CareLab network.

4.4.2 Interaction network 2: Interaction during meetings

The 'interaction during meetings' networks show more extreme results between the different cases. As presented in table 10, the unsuccessful CareLab case has a very low overall density, meaning that actors are to a low extent connected to each other. Especially actors in the Invasive Species case tend to elaborate on each other's ideas as almost half of the actors is directly connected to each other.

Clique overlap

Especially the actors in the Invasive Species network are highly-integrated as everyone is part of at least one clique in the network, meaning that every respondent is part of a group of a minimum of three actors who frequently elaborate upon each other's ideas. It must be stressed stress, however, that the two non-respondents in this case were not taken into account[8].

Whereas in the Invasive Species network every actor is a member of at least one of the five different cliques, making this a well-integrated network, the other networks contain fewer cliques and only a small percentage of the actors are member of at least one clique. In the Radicalization network, only three actors form a clique together, and in the CareLab network just four actors. This means that in both a successful (Radicalization) and an unsuccessful (CareLab) case only a small core group of actors elaborated upon each other's ideas. The Invasive Species network consists of substantial larger cliques than the other networks with an average size of 4.6 compared to the minimum amount of three actors in the other cases, indicating strong integration of actors in this network. The high average clique centrality indicates that actors are on average a member of 2.54 cliques, which is considerably higher than in the other cases.

[8] Due to a different way of measurement, no network data of non-respondents was available, hence non-respondents in all three cases were excluded from the analysis of the 'elaboration upon other's ideas' network.

	CareLab	Invasive Species	Radicalization
Network density	0.085	0.455	0.156
No. of cliques in network	2	5	1
Average clique size	3	4.6	3
Clique density	0.13	1	.33
Average clique centrality	0.33	2.56	0.33
Individual clique centralities	0 to 2	1 to 4	0 to 1
Complete integration of cliques at level: (hierarchical clustering of cliques)	2	4	Not applicable, as only one clique is observed in this network.
Top important actors (with individual clique centrality)	1. Local coordinator 1: 93% (clique centrality: 2) 2. Parent 1: 67% (0) 3. Private actor 5: 60% (2) 4. Federal coordinator: 60% (1)	1. Public actor 2 Flemish: 38% (1) 2. Public actor 2 Walloon: 25% (1) 3. Public actor 1 Brussels: 25% (1)	1. Federal actor 4 (coordinator) 78% (1) 2. Federal actor 1 67% (0) 3. Federal actor 2 67% (0)

Table 10. Network integration 'interaction during meetings' network

The individual clique centrality shows that, again, no actor in the Invasive Species case is a member of all five cliques. However, multiple actors have an individual clique centrality of four, indicating membership of four cliques and a strong level of clique overlap. In CareLab, a larger amount of clique overlap is present as the results of the hierarchical clustering procedure shows, but as only four actors are a member of a clique this only implies a strong core group of four actors, but poor integration on the whole network level. As the Radicalization network only consists of one clique, obviously no clique overlap occurs in that network. Thus, the Invasive Species case has the strongest integrated network in which all actors actively elaborate upon each other's ideas. On everyone's idea is built upon by at least two other actors given that every actor is member of a clique.

Actor importance

Concerning actor importance, in the CareLab network it was found that the members of a clique are among the most important actors of the network. Still some actors who are regarded as being very important to the process are not included in any clique.

The most important actors in the Invasive Species case are only to some extent a member of a clique. They are only part of one clique, while less important actors are a member of up to four different cliques. It can be argued that the most important actors are to some extent well-integrated in the network, but the network is centralized towards less important actors. In other words, the most important actors do no function as brokers in this network. However, as clique density is high, they are tightly connected to most other actors in the network through clique overlap.

In the successful Radicalization network, only one clique is observed. The most important actor is present in this clique, however as no other cliques are present in this network the overall integration of the network is poor. Especially a group of three actors elaborated upon each other's' ideas, while only one of these actors were frequently named as very important to the process.

These results indicate that the Invasive Species case has a more or less same network structure and clique formation in both networks, whereas a clear difference between the networks in the CareLab and Radicalization cases is observable in terms of clique formation and inclusion of the most important actors. The clique overlap in these latter two cases depends on the type of network, while this is to lesser extent observable in the Invasive Species case.

4.5 Discussion and conclusion

The goal of this study was to examine how innovative outcomes of collaborative public sector innovation projects can be explained by the network integration of its most important actors. Following from the work on clique overlap and information ties (e.g. Provan and Sebastian, 1998; Hu et al., 2022), collaborative innovation (e.g. Ansell and Torfing, 2014:11) and actor importance (e.g. Stevens, 2018; Cristofoli et al., 2021) it was hypothesized that cases with successful innovative outcomes are characterized by a high degree of clique overlap in terms of the most important actors being included in multiple cliques, both during and outside meetings.

This hypothesis can only be confirmed for the 'interaction outside meetings' network. The findings are in line with the argument that clique overlap is related to positive network outcomes. We found that the cases with higher innovative outcomes have a higher integrated network concerning sharing information outside meetings (Raab et al., 2015; Cristofoli & Markovic, 2016). The most important actors being a member of multiple cliques in the successful Radicalization case indicates that the most important actors are in close contact with less import actors and thus act as brokers that connect the different actors with each other. In contrast, the few actors in cliques of the less successful CareLab case are among the most important actors which points to a very important regarded 'in-group', that mainly shares information with each other, while the other less important actors hardly interact with each other. The Invasive Species case shows a high amount of clique density and overlap, however, in this case the most important actors are less well-integrated as they are in fewer cliques.

A same type of integration was expected to be present in the 'interaction during meetings' networks. It was expected that successful cases have a higher level of clique density, higher clique centrality of the most important actors, and clique overlap. This is confirmed to some extent as the relatively successful Invasive Species case has a higher level of clique density and more actors are a member of a clique than the CareLab network. However, the successful Radicalization case follows the pattern of the less successful CareLab case in the 'interaction inside meetings' network: limited cliques, with little involvement of most actors, including the most important ones. Therefore this hypothesis cannot be fully confirmed for the 'interaction during meetings' network.

This study examined how innovative outcomes of collaborative public sector innovation projects can be explained by the network integration of its most important actors. Unlike what theory suggests, it can be concluded that successful innovative outcomes are only to some extent explained by the way the most important actors are integrated through clique overlap and depends on the type of network. A well-integrated network (with important actors connected through clique overlap) is not necessarily always a crucial driver for the development of collaborative innovation as the successful Radicalization case shows poor network integration during meetings. In that sense, the findings refine the argument that information flow is crucial to the development of innovative outcomes (Koliba et al., 2017), as the findings show that a well-connected network is not necessarily always needed. This may indicate that successful cases spend less time on deep

discussions and idea generation during broad general meetings and actors in successful cases are more inclined to connect with each other outside meetings to work out details with the relevant actors without the inclusion of non-essential actors. Still, the results also indicate that a certain amount of dispersion of important actors throughout the network seems needed (see also Yi, 2018) as it was found that the less successful CareLab case is characterized by an important in-group that does not connect with other actors in the network.

This study builds upon the milestone study concerning clique overlap as most effective way for information flow in collaborative arrangements (Provan & Sebastian, 1998). Moreover, it was the first to examine clique overlap in combination with the position of most important actors in the network and to make the distinction between interaction inside and outside meetings. Furthermore, this study is one of the firsts to examine clique overlap in relation to (digital) public sector innovation. To date, the role of the integration of the most important actors in the networks was only studied to a limited extent, while research suggests that on the one hand, network position of certain main actors (such as the coordinators) lead to more effective outcomes (Raab et al., 2015; Cristofoli et al., 2021) and on the other hand, that actor importance is associated with innovative outcomes (Stevens, 2018). No study had examined the combination of clique overlap as a way of network integration in combination with actor importance. Moreover, usually no distinction between the complementary networks concerning information sharing inside official meetings, and outside official meetings is made.

The findings suggest that collaborative innovation networks do not necessarily always have to be well-integrated through clique overlap both inside and outside official meetings when developing an innovation. The findings are therefore a refinement to the classic studies (e.g. Provan & Sebastian, 1998) that argue that clique overlap is an important driver for positive network outcomes. Clique overlap seems to be of lesser importance for building upon each other's ideas inside meetings and important actors do not necessarily have to engage in interactions in order to achieve successful innovative outcomes.

It must be acknowledged that the nature of the cases was different. The successful Radicalization case was working towards a clear end goal, and thus formal meetings were less characterized by idea generation and building upon each other's ideas. Instead, actors interacted with each other outside formal meetings for the arrangement of more practical resources and 'to get things done', which

might point to strong commitment towards the innovation and formal meetings were not necessary to let actors interact with each other. In other words, there was no real need to build upon each other's ideas as the end goal and the way to reach it was more or less known already.

In contrast, CareLab was very much in the idea generation phase, so interaction within meetings was necessary to create a process of synergy that enabled the collaborative arrangement to formulate innovative ideas. However, no proper ideas that included all perspectives and that could count on actual support were developed due to the poor network integration. Interaction mainly focused on an important 'in-group' and other actors did not interact with each other, thus reducing a process of collective idea generation. For that reason, the phase of the innovation process might explain why poor integration of the network led to a lack of innovative outcomes in CareLab, while this was not an issue in the Radicalization case. The Invasive Species case shows in that respect a mixture between the two projects. This case was also largely implementation-oriented, however, as some ideas still needed to be decided upon, building upon each other's ideas in formal meetings was still very much necessary. This might be a reason why actors in this case are tightly connected both inside as outside meetings, but that lack of active involvement of the most important actors explains why this case does not have the highest innovative outcomes. Practitioners or coordinators of innovation projects should therefore be aware of the phase of the innovation project. They have to determine to what extent integration through clique overlap is needed and when, during or outside meetings, the most important actors should interact more with each other and/or the other actors.

Besides the difference in cases, this study has some other limitations. The data stems from one survey in which respondents were asked to evaluate their own project. Hence, their opinion on the innovative outcomes might be biased by their experiences in the project. Moreover, it is hard to determine whether importance leads to better integration, or if better integration has led to higher importance. Tsai (2001) and Zhao (2022) argue that central actors are more likely to access useful knowledge from others. Hence, better integrated actors might be considered more important. In contrast, resource dependency theory (Hillman et al., 2009) argues that the resources of an actors determines its importance. This study did not examine why certain actors are regarded as being more important, so this is an interesting direction for future research.

Future research should also examine what the ideal network structure is for different types (idea generation oriented or implementation oriented) of innovation processes and to what extent the findings are generalizable to other innovation projects. Moreover, the findings indicate that collaborative arrangements aimed at innovation should be aware of the interconnectedness of all actors in the network through clique formation in such way that important actors are well-connected with the others; especially outside official meetings. This study did not examine why actors are more likely to interact with others and thus why certain cliques are formed. Future research should examine what drives interactions in the networks in order to determine how clique formation can be achieved.

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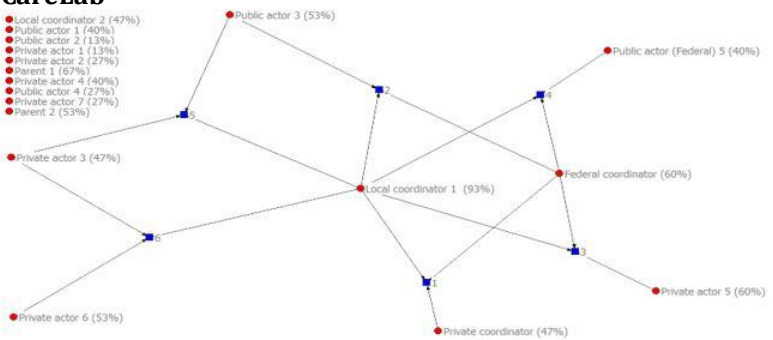
Appendix chapter 4

Membership of cliques ´interaction outside meetings´ network

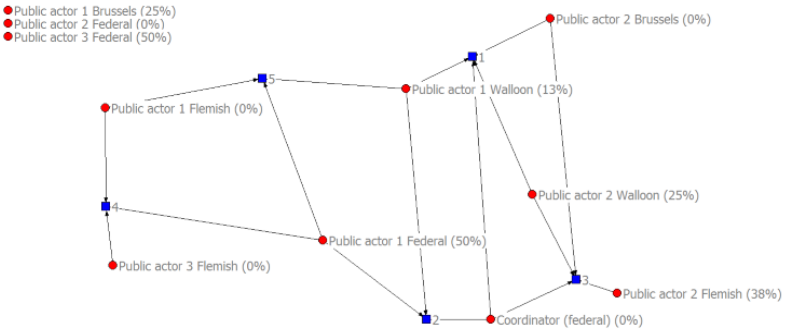
CareLab	**1:** Federal coordinator, Local coordinator 1, Private coordinator **2:** Federal coordinator, Local coordinator 1, Public actor 3 **3:** Federal coordinator, Local coordinator 1, Private actor 5 **4:** Federal coordinator, Local coordinator 1, Public actor (federal) 5 **5:** Local coordinator 1, Public actor 3, Private actor 3 **6:** Local coordinator 1, Private actor 3, Private actor 6
Invasive Species	**1:** Coordinator (federal), Public actor 1 Walloon, Public actor 2 Walloon, Public actor 2 Brussels **2:** Coordinator (federal), Public actor 1 Walloon, Public actor 1 Federal **3:** Coordinator (federal), Public actor 2 Flemish, Public actor 2 Walloon, Public actor 2 Brussels **4:** Public actor 1 Flemish, Public actor 3 Flemish, Public actor 1 federal **5:** Public actor 1, Flemish Public actor 1 Walloon, Public actor 1 federal
Radicalization	**1:** Federal actor 1, Federal actor 2, Federal actor 3, Federal actor 4 **2:** Federal actor 1, Federal actor 4, Federal actor 6 **3:** Federal actor 1, Federal actor 4, Federal actor 8 **4:** Federal actor 4, Federal actor 6, Federal actor 9 **5:** Federal actor 2, Federal actor 4, Federal actor 9

Visual representation of clique membership in 'interaction outside meetings' network (actor importance in parentheses)

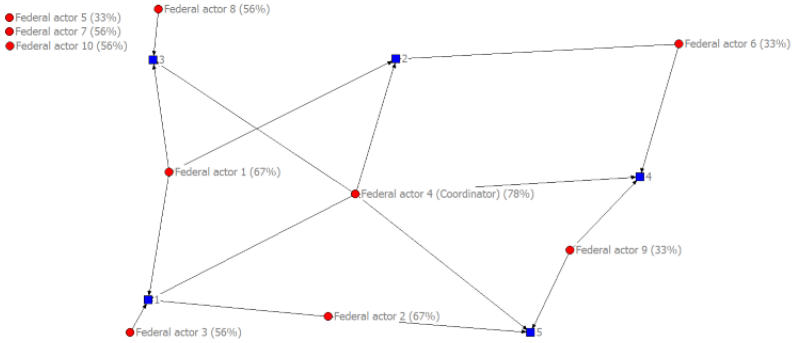
CareLab



Invasive Species



Radicalization

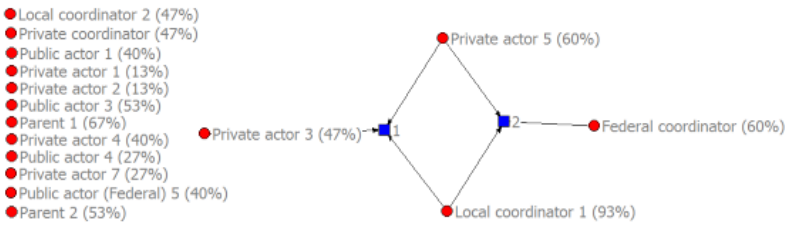


Membership of cliques 'interaction during meetings' network

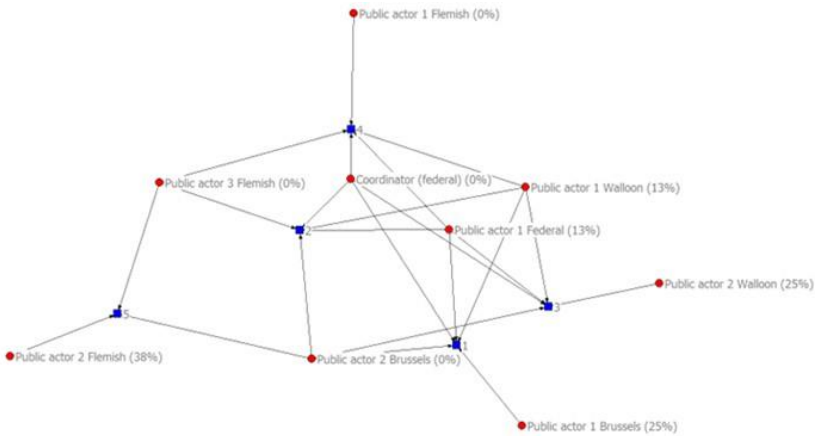
	Cliques 'interaction during meetings' network
CareLab	**1:** Local coordinator 1, Private actor 3 Private actor 5 **2:** Federal coordinator, Local coordinator 1, Private actor 5
Invasive Species	**1:** Coordinator (federal), Public actor 1 Walloon, Public actor 1 Brussels, Public actor 1 Federal, Public actor 2 Brussels **2:** Coordinator (federal), Public actor 1 Walloon, Public actor 3 Flemish, Public actor 1 Federal, Public actor 2 Brussels **3:** Coordinator (federal), Public actor 1 Walloon, Public actor 2 Walloon, Public actor 1 Federal, Public actor 2 Brussels **4:** Coordinator (federal), Public actor 1 Flemish, Public actor 1 Walloon, Public actor 3 Flemish, Public actor 1 Federal **5**: Public actor 2 Flemish, Public actor 3 Flemish, Public actor 2 Brussels
Radicalization	**1:** Federal actor 4, Federal actor 5, Federal actor 7

Visual representation of clique membership in 'interaction during meetings' network (actor importance in parentheses)

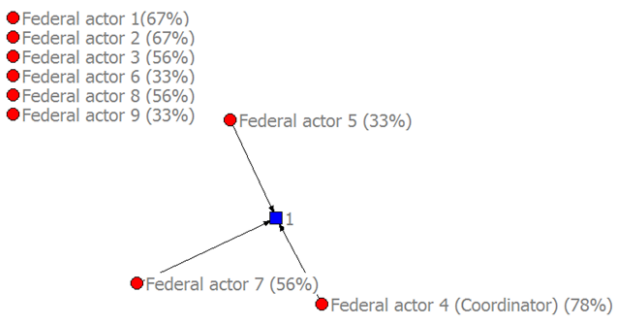
CareLab



Invasive Species



Radicalization



Chapter 5

Explaining interactions in collaborative innovation arrangements

ABSTRACT

Innovation through collaboration has been increasingly adopted to tackle complex social issues. As a result, the development of public sector innovations is to a lesser degree an 'in-house' matter and public sector innovations are increasingly developed in collaborative arrangements that force organizations to interact across organizational borders. Despite the growing body of literature on collaborative innovation, little is known about the influence of organizations on the interactions of their members represent their organization in such collaborative arrangements. Through social network analysis, it is examined how organizations influence the eagerness of their representatives to engage in interactions outside official meetings with the other participants in these collaborative innovation arrangements. It was found that the representative's freedom to act and the extent to which the higher-level managers of the own organization sees the innovation project as a priority stimulates the extent to which the member interacts with other participants in the arrangement. Moreover, reciprocity and having a coordinating role in the process determines interaction as well.

Keywords: innovation, collaboration, network structure, information sharing, home organizations, ERGM

5.1 Introduction

Throughout the years, the expectations about the quality, availability, and effectiveness of public services have increased, as well as the growing demands for governments to be responsive (Sørensen & Torfing, 2012). Moreover, a growing number of public policy tasks involve wicked problems that cannot be solved with more money, standard solutions or within the own bureaucratic organization (Bommert, 2010; Wynen et al., 2014). As a result, government organizations increasingly need to collaborate with external partners and have to be innovative in order to solve societal problems. Inter-organizational collaboration is nowadays regarded as being an essential feature of a successful innovation process as

interaction ties with external actors can bring essential building blocks of innovation such as the creation of synergy (Hartley et al., 2013; Agger & Sørensen, 2018). Consequently public sector innovations are increasingly developed in collaborative arrangements in which members of different organizations engage in interactions.

The response to collaborate stems from the principles of New Public Governance (NPG), that in contrast to traditional hierarchy-based coordination or New Public Management (NPM) has been focusing on collaboration with actors outside the own organization for the development of solutions for societal problems (Denhardt & Denhardt, 2015). Traditional hierarchy-based coordination or coordination through market mechanisms (in NPM) are believed to be ineffective ways to develop innovative solutions to societal problems because these types of coordination are rigid and do not optimally use the resources of external organizations (Keast et al., 2006; Torfing, 2019).

However, the classic hierarchy-based type of governance has not disappeared entirely. Unlike private sector innovation, public sector innovation is to a higher extent subjected to public accountability and the logic of appropriateness (Bekkers et al., 2011). To ensure that the innovation (process) is appropriate in its public context, bureaucratic characteristics such as a focus on regulation and control remain important in collaborative innovation processes (Bekkers et al., 2011; Borins, 2001; De Vries et al., 2016; Sørensen & Torfing, 2011).

In theory, this should lead to a tension when collaborating for public sector innovations. Representatives acting on behalf of their organization remain subjected to the coordination of their organization, also referred to as 'steering from a distance', and have to balance between the discretion and the control given by their organization when interacting with external actors (Kickert, 1995; Qvist, 2017; Verhoest et al., 2007; Fimreite & Lægreid, 2009). However, the development of innovation requires a 'thinking out-of-the-the box' process in which everyone is able to freely share information and ideas, especially when the process is very open and is focused on gaining as much insights as possible to come to innovative ideas and does not yet needs guidance for successful implementation. This process should not be hindered by too much control and interference of the home organization (Cinar et al., 2019; Lopes & Farias, 2020; Yang & Maxwell, 2011). Too much interference from the home organization can influence the likeliness to information sharing and consequently how innovative a solution is. Hence, a

tension can be observed between top down command and control by the organization towards its representatives in the collaborative arrangement versus the needed self-regulating capacity of the collaborative arrangement.

Studies on interactions in such arrangements tend to focus mainly on how the network coordinator of the collaborative arrangement influences the interactions in the collaborative arrangements (Gjaltema et al., 2020). However, what is not yet studied is the way how the organizations participating in collaborative innovation arrangements (*which is labeled as 'home organizations' in this chapter*) influence the extent to which the individuals representing them in the arrangement (*referred to as organizational 'representatives' in this chapter*). As interaction within such collaborative innovation arrangement is crucial for the development of public sector innovations it raises the question to what extent the home organization influences its representative's likeliness to interact with others in the collaborative arrangement aimed at innovation.

To that end, the central research question in this chapter is:

To what extent do the representatives' home organizations influence the interactions of their representatives in collaborative arrangements which are aimed at innovation?

This is studied by executing a social network analysis on the interaction networks of two cases in which a collaborative arrangements was created in order to develop a public sector innovation. Firstly, an overview of the scientific literature is provided, after which the chosen methodology is discussed. Next, the results are presented and consequently, the chapter ends with a discussion and conclusion.

5.2 Theoretical framework

5.2.1 Public sector innovation and the need for inter-organizational interaction

As stated, innovation through inter-organizational collaboration is becoming more important to solve societal problems as standard solutions developed within the own organization do not longer suffice (Bommert, 2010). Conceptualizations of public sector innovation have drawn criticism by some scholars as existing conceptualizations do not reflect the nature of public organizations and they still build too much from a private sector perspective and overlook the added public value of public sector innovation (Chen et al., 2020). Public value reflects the

quality of individual and collective life for citizens shaped by the normative consensus of society, policies, and governance (Geuijen et al., 2017). Chen et al. (2020) define public service innovation as: *"the development and implementation of a novel idea by a public service organization to create or improve public value within an ecosystem."* Although this definition focuses on public service innovation, and not on the broader concept of public sector innovation it contains the most common elements in conceptualizations of public sector innovation, including an emphasis on the innovation being a novelty, the first adoption of an idea, and a process (Sørensen & Torfing, 2012; De Vries et al., 2016).

Recently, the participation of relevant stakeholders in the innovation process is seen as increasingly important and valuable (Dockx, et al., 2022; Callens et al., 2023; Torfing, 2019). Collaboration with a wide variety of actors helps to get a better and more nuanced understanding towards the problem at hand, and it mobilizes resources (Vangen, 2017). The traditional internal focus of forms of governance through hierarchical steering and market mechanisms are regarded to be insufficient to tackle wicked problems in today's society. Also, advancement of modern information technologies facilitate collaboration between all relevant stakeholders (Geuijen et al., 2017). Thus, for tackling societal wicked problems governments are increasingly moving towards a network type of governance (Torfing 2019; Barrutia & Echebarria, 2019).

Hence, participation in networks and inter-organizational relations is regarded as an important determinant for collaborative innovation (e.g. Callens, 2022; Lewis, et al., 2018; Stevens, 2018). Interaction allows actors to share for example different points of view toward the problem at hand. Connecting with others and being able to freely share ideas and information is an important attribute for innovation because it enables individuals to link different insights, actors or resources to each other (Van Meerkerk & Edelenbos, 2014; Koliba et al., 2017; Gieske et al., 2019).

Connecting with others in a collaborative arrangement stimulates public sector innovation as inadequate communication and knowledge sharing between public organizations is named as being a barrier to collaborative innovation (Cinar et al., 2019). Remarkably, research usually tends to focus on interaction and sharing of information during official meetings. However, an innovation process is also an inherently uncertain process (Torfing, 2019). Actors invest resources, while they do not know what the outcome will be and thus have to act strategically. In this respect, only a few studies emphasize the significance of interactions outside

meetings or 'between-meeting interactions' for strategy dynamics in meetings (e.g. Skov et al., 2023). For example, interaction around meetings is deemed important as it can enhance an understanding and alignment towards an issue and supports the flow of discussion (Hoon, 2007). Moreover, interaction outside meetings helps to influence the overall strategy during formal meetings (McNulty & Pettigrew, 1999). Interactions among collaborative partners outside meetings is, however, widely overlooked in the collaborative innovation literature.

5.2.2 Organizational influence on the innovation process

Public sector innovations are commonly developed in socio-political environments which are skeptical towards innovation, affecting the willingness of the participating organizations to innovate within such collaborative arrangements and the extent to which the innovation process is controlled by these organizations (Lopes & Farias, 2020; Bommert, 2010). The representative of the participating organization constantly has to balance between the discretion and control it is experiencing from its home organization when engaging in interactions. Moreover, representatives have to act strategically, for example by forming strategic alliance, as the process is uncertain (Di Guardo & Harrigan, 2012). Yet, to date little is known what the effects of the home organization is on the representative's likeliness to interact with the other representatives.

Research on interactions in collaborative innovation arrangements is often focused on the network level. That is, for example how interactions are driven by network factors such as the embeddedness of actors in the collaborative arrangement (Gilsing et al. 2008; Huggins et al., 2020), or how a network coordinator applies certain strategies to smoothen interactions between actors (Gjaltema et al., 2020; Ansell & Gash, 2018; Ayres, 2019). Furthermore, Stevens (2018) was one of firsts to examine interactions in collaborative innovation arrangements aimed at innovation through quantitative social network analysis, but his analysis did not include organizational variables.

These are all studies that explain interactions in collaborative innovation arrangements, but they are focused on network or individual characteristics of the network coordinator or the representatives. Moreover, they tend to focus on what happens inside formal meetings.

Yet, the individuals in such collaborative arrangements are most often representatives of their respective home organizations (De Vries et al., 2016).

Given the sometimes closed character of governmental organizations and the reluctance of sharing information with external actors (Cinar et al., 2019; Bommert, 2010), it raises the question to what extent the organization provides the conditions for their representatives to interact with the representatives of other organizations, also in the 'between-meeting interactions'.

5.2.3 Determinants for interactions in collaborative arrangements

In this study, several antecedents are examined that are believed to have an effect on the extent to which individuals representing their home organization in the collaborative arrangement interact with others during the innovation process that takes place in that arrangement. Inter-organizational interaction means overcoming institutional and organizational borders (Gieske et al., 2019). Concerning organizational characteristics, several literature reviews have been made that systematically examine what organizational factors contribute to inter-organizational information sharing (Yang & Maxwell, 2011; Fan et al., 2014). One characteristic concerns the issue of control mechanisms. Innovation projects are inherently uncertain and risky for the involved organizations (Torfing, 2019). As it is not always certain if the organization benefits from sharing information or if the organization, loses autonomy, has a lack of trust towards the other organizations or the information is sensitive, the organization may have control mechanisms. However, control mechanisms are found to increase the difficulty to inter-organizational information sharing as information is less easy to freely share (Yang & Maxwell, 2011). Furthermore, centralization of decision-making capacity and formalization has a negative effect on the innovative culture within an organization, as decisions cannot be made fast and easily (Slater & Narver, 1995; Vigoda-Gadot, 2009). Autonomy can make employees feel responsible for the success of the innovation because they are the owners of the idea which can spur the motivation to actively engage in the collaborative arrangement (Demircioglu, 2021). Moreover, the development of innovations is helped by an organizational climate that provides the ability for individual discretion (Meijer & Thaens, 2021; Mathisen & Einarsen 2004). Employee autonomy and an absence of legal restrictions is found to have a positive effect on innovative work behaviors (Ramamoorthy et al., 2005, Lopes & Farias, 2020). This would indicate that on the individual level a larger personal freedom to act as the representative sees fit is an incentive to actively interact in the innovation process.

A theoretical expectation which derives from this line of reasoning would be that a high level of freedom to act as the representative wants explains the occurrence of

more interaction by organization's representative with other actors in the collaborative innovation network.

H1: Representatives who perceive more freedom to act as they want are more likely to share information in collaborative innovation arrangements.

However, this could suggest that as little interference of the home organization as possible is the best way to stimulate active participation in innovation processes. A second –somewhat opposed expectation- is that interaction to innovate can also be stimulated by organizational factors. A lack of managerial support towards the innovation is named as hindrances towards collaborative innovation (Lopes & Farias, 2020; Cinar et al., 2019). This is supported by research suggesting that the commitment of the top management, such as making resources available within the organization has a positive effect on inter-organizational information sharing behavior (Gil-Garcia & Sayogo, 2016; Maskey et al., 2020). Supportive leadership enhances interaction as representatives are more inclined to share information when their management is providing guidance, vision and financial resources towards the project (Yang & Maxwell, 2011; Urbano et al., 2022). Moreover, supportive leadership institutionally legitimizes the collaboration and thus, enhances information sharing (Dawes & Préfontaine, 2003; Urbano et al., 2022).

Related to having a supportive home organization, prioritizing of the innovation can explain information sharing in collaborative arrangements aimed at innovation. At an organizational level, performance pressures force public managers to innovate (eg. Lægreid, et al., 2011; Wynen et al., 2013). The pressure for performance arising from organizational goals, rewards and incentives has been found to stimulate inter-organizational information sharing (Kashef Al-Ghetaa et al., 2022). This effect can also be present in the way individual representatives feel the pressure from their home organization to interact intensively with other actors in the collaborative arrangement, since obligations to innovate can lead to innovative behavior (Ramamoorthy et al., 2005). A strong top-down prioritization might force employees to engage in interaction, for example by aligning strategies outside meetings, in order to come to innovative outcomes. Hence, the following two hypotheses are formulated:

H2: Representatives who perceive more commitment of their home organization to continuously support the innovation are more likely to share information in collaborative innovation arrangements.

H3: Representatives who perceive a higher priority of the organization's higher management towards the innovation are more likely to share information in collaborative innovation arrangements.

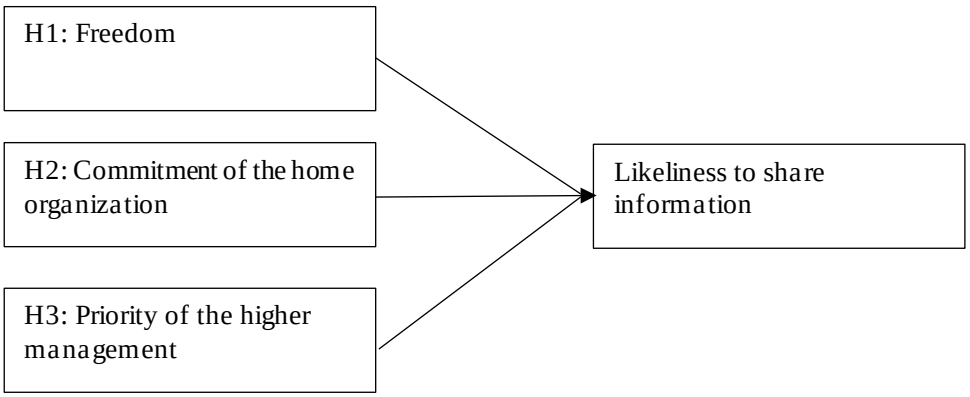


Figure 2. Hypotheses

5.3 Methodology

To answer the research question, quantitative data from two different collaborative innovation projects in Belgium were collected CareLab (18 actors), and Connecting Healthcare (12 actors). The cases consisted of an arrangement of different actors (representing their home organization), which frequently came together with the specific aim to develop a public sector innovation. Each actor was asked to complete an online survey to map the interactions in the collaborative arrangement, allowing us to do a social network analysis. Also, every actor was interviewed about the collaborative innovation project they were involved in. The qualitative data from these interviews will only be used in this study to underpin and illustrate the interpretation of the quantitative analyses. The data was collected between April 2017 and March 2018.

5.3.1 Description of the cases

CareLab

CareLab is a project focusing on the simplification of rules and bureaucracy for parents with a disabled child. The project originated from parents' stories that illustrated the human impact of the rules and procedures that they have to deal with and about the effect that this complexity has on the parents and their children.

A federal agency initiated the project together with some public officials to take action with the notion how it is 'to stand on the other side' in mind. The project team decided to limit the 'field of operation' and to focus on the needs and possibilities on a local scale. During the process a core group of committed people could be identified. The project ended with the formulation of four possible innovative solutions (both digital and administrative), and a first step towards implementation. After that, core actors left the process and sustainable implementation of these solutions did not take place.

Connecting Healthcare

Connecting Healthcare is a project in which an IT system was developed for administrative simplification. In short, it ensures (among other things) that hospitals, general practitioners and pharmacies have easy online access to information about their patient's social rights, most specifically about whether their medical expenses are covered by social services. This way, when a socially vulnerable patient comes in asking for a reduced fee, the caregivers can find out if social services will compensate them for charging the reduced fee. Moreover, this project is about administrative simplification. It reduces the administrative burden by electronically processing information and keeping it on a central platform. The studied period is just like in CareLab the phase of idea generation, selection and a first step towards implementation. This project consisted of different actors, such as local social services, a federal ministry and associations for Flanders', Walloon and Brussel's municipalities.

5.3.2 Comparison of the cases

The cases are comparable in several ways. Both cases deal with the issue of administrative burdens in the Belgian healthcare sector and consist of a medium sized collaborative arrangement that came together every few weeks. The cases entail collaborative arrangements/networks involving both governmental organizations and non-public/private actors with the specific aim to develop an innovation. The type of actors are comparable as well, being -among others- caregivers and federal, regional and local agencies. As the cases are both in the healthcare policy field, both cases deal with interaction between government agencies and actors from the healthcare sector. Both cases are characterized by a hands-on coordinator who actively participated in the interactions. The interactions are described as being informal in both Carelab and Connecting Healthcare. Moreover the phase in the innovation process is similar as both cases were at the end of the phase idea generation phase and before the start of

piloting/implementation. A main difference is that CareLab did not result in an actual implemented innovation, while Connecting Healthcare did. Also, CareLab was much more a thinking exercise on how to reduce administrative burdens in the healthcare sector with actors that voluntarily participated in the project as they were interested in the topic at hand. From there, they would see if they could implement the ideas. In contrast, the goal for Connecting Healthcare was already much more specified and an implemented innovation was expected by the involved federal organizations.

5.3.3 Data gathering and analysis

Exponential random graph modelling (ERGM) was executed to explain interactions in the networks of the two cases. All representatives in the cases were asked to evaluate their interactions with the other representatives in order to determine the interactions in the cases.

As argued in the theoretical framework, the dynamics of 'in-between meetings interactions' are significant for strategy dynamics in a collaborative process, but is overlooked in the public sector innovation literature. Hence, it was measured how the members of the collaborative arrangement interact outside formal meetings and therefore what drives why actors actively reach out to each other outside meetings in order to innovate.

Moreover, in the theoretical framework, it was argued that innovations are commonly developed in socio-political environments which are skeptical towards innovation and therefore organizations might be reluctant to share information or have to form alliances given the uncertainty of the process. By looking at interactions outside meetings, it was specifically examined how representatives (strategically) position themselves by sharing information, such as organizational documents, one-on-one advices and remarks. That way, the findings relate more to the sensitive socio-political context and the important, commonly overlooked interactions surrounding formal meetings (Skov et al., 2023).

The network which can be constructed from the following question was examined in this study:

Can you please indicate to whom you gave and from whom you received information, after and outside of formal meetings? "Information" includes reports, statistics, advice, and remarks. This information can be both verbal and written.

To increase reliability, a tie was only considered when it was confirmed on both sides. For example, if actor "i" claimed that he gave information to actor "j," it was only regarded as a tie when actor "j" indicated that he received information from actor "i.". In the very limited times where this was not possible due to missing network data because an actor did not fill out the survey, a tie was considered by confirmation of only one actor.

The respondent's answers on this question provided the necessary data to reconstruct the interactions in the collaborative innovation arrangements.

The collected data in the cases provided the possibility to use a model to determine by which factors the ties in the networks are driven (Snijders, 2017). The networks were analyzed with an Exponential Random Graph Model (ERGM). ERGMs are statistical models for explaining the network structure, permitting inferences about how network ties are patterned (Lusher et al., 2013:9). The approach of this method is based on an actor-based model, which means that the social actors represented by the nodes play a crucial role in changing their ties with others. ERGMs are able to explain the interactions between actors based on the network structure and characteristics of the actors (the so-called node covariates). It explains why some actors are more likely to interact with each other than with others in the network. It does so by simulating all possible networks given the amount of actors and determining the chances that a tie in the observed (meaning: real life) network exists by mere coincidence or is driven by network or actor characteristics. It is thus the ideal method for exploring the underlying mechanisms in collaborative innovation networks. The ties between actors in these networks are the dependent variables in the study.

Independent variables

Six independent variables were included in the models that are related to the home organization of the representative. For the first three variables actors could indicate their perception on an 11-point Likert-scale between two extremes.

1) The perceived freedom of individual representatives to act as they saw fit; the extremes being:
   I had no freedom at all to act like I wanted during the interactions with the other participants in [the process]/I had complete freedom to act like I wanted during the interactions with the other participants in [the process].

2) The perceived level of organizational commitment to the innovation (to what extent the organization is willing to continuously support the innovation); the extremes being:
   From our organization, the continuous support for the realization of [the innovation]cannot be expected/From our organization, a large continuous support for the realization of [the innovation]can be expected.
3) The extent to which the actors felt the development of the innovation was a priority for their managerial superiors in their home organization with regards to their actions in the collaborative innovation network. The extremes were:
   The establishment of [project] was no priority at all for the higher levels in my organization/The establishment of [project] was a top priority for the higher levels in my organization

For these variables, we looked at the extent they influenced the representative's out-degree, which means that it was possible to determine if representatives scoring higher on these variables were more likely to have more out-going ties (representing eagerness to interact).

The following variables were included to control for network characteristics and personal characteristics:

4) A variable concerning the experience of the actor towards the problem at hand was included as control variable in the models.
   For how many years have you been dealing with [the policy issue] in your (working) life?
   0-2 years 3-5 years 6-8 years 9-11 years More than 11 years

   The policy issue was 'disability care' in the CareLab case and 'healthcare' in the Connecting Healthcare case.

'Experience' was operationalized this way, because we in order to have added value to the innovation process, someone needs to be able to have sufficient insights into the problem at hand. As both cases deal with an innovation concerning the government apparatus, we argue that someone is more experienced when he/she has dealt longer with the organizations in this field. Both the out-degree as the in-degree were examined for this variable as we believe that experience influences a

representative's popularity (for example by being asked more frequently to share information or by having a larger social capital in the policy field) as well as its eagerness to interact with others (because the representative simply has more information to share).

5) Reciprocity, which indicates the tendency to form dyadic relationships. (Actor "i" gives information to actor "j," and actor "j" gives information to actor "i" in return.) This standard network variable follows from the previously mentioned question that maps interactions (*Can you please indicate to whom you gave and from whom you received information, after and outside of formal meetings?).* As this question enabled us to map the direction of the ties between actors, it was possible to use that same information to calculate (using ERGMs) to what extent a reciprocity-effect drove interactions. As mentioned, a tie was only considered when it was confirmed by both actors (actor "i" indicates that he gave information to actor "j", and actor "j" indicates that he received information from actor "i").
6) Whether the actor is the coordinator of the collaborative arrangement. This was determined by the researchers based on interviews with the members of the collaborative arrangement. The CareLab case consisted of four actors who could be regarded as coordinators; Connecting Healthcare of three. Again, both the out-degree as the in-degree was examined for this variable as we are interested to what extent having a coordinating function is a factor for popularity as well as eagerness to interact with others.

The models were constructed by starting off with the most basic model with only one term (edges) that captures the density of the network, the so-called Bernoulli/Erdös-Rényi model (Goodreau, 2007). Next, we added reciprocity to the model to see how this property which is inherent to the network influences interactions. With this model we included the two most fundamental network configurations (Lusher, et al., 2013). We only choose to include reciprocity as the core of this study concerns the organizational variables and wanted to prevent overspecification bias given the relatively small size of the networks. Third, we added the exogenous nodal covariates (freedom, commitment, priority, experience, and coordinating function).

The quality of the models was examined with three approaches which are common in ERGM analyses. Firstly, we checked for generacy and model convergence. The model should converge on finite parameter values and must be non-degenerate,

meaning that the model does not place all of its probability mass on a few networks entirely unlike the observed network (Stevens, 2018). We checked MCMC trace and density plots. All values of the sample statistics centered at zero and had the correct shape (sawtooth in trace plot; bell shape in density plot), indicating random variation at each step, and model convergence. Secondly, the Akaike information criterion (AIC) was examined to estimate the quality of each model; with a lower AIC representing a significant better fit of the model (Stevens, 2018). Thirdly, the goodness of fit was examined by plotting the model against the higher order statistics in-degree, out-degree, edge-wise shared partners, dyad-wise shared partners, and the minimum geodesic distance (Hunter et al., 2008). This shows whether the observed network is consistent with the networks generated from the model. The plots visually showed that the observed statistics fall within the range of the simulated values.

Based on these checks, it was concluded that the models were suitable to use in this study.

5.4 Results

Figures 3 and 4 show the network structures of the studied cases. The figures shows the visual presentation of the network and the directions of the interactions.

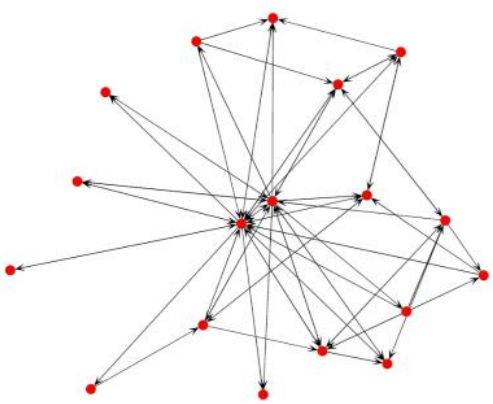


Figure 3. CareLab network

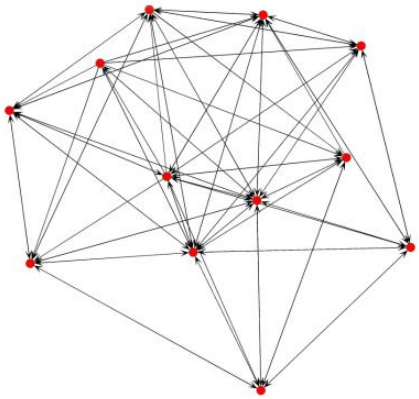


Figure 4. Connecting Healthcare network

The CareLab network has a relatively low density (0.209) compared to the Connecting Healthcare case (0.651). Interesting to see is that the CareLab case has some very central nodes who are in touch with almost every other node, while the other nodes are far less connected to each other. Not surprisingly, these well-connected nodes in the network are some of the coordinators of the case.

To explain what drives these interactions, we have to turn to the results of the ERGM analyses in table 11. Presented are the log-odds ratios[9].

Reciprocity

Reciprocity is one of the most important variables in the models; explaining interactions in networks of both networks with high log-odds, indicating that interactions are for a large part driven by a reciprocity effect. Actors give information to someone when this happens in return. Representatives in the CareLab case are more likely to give information to actors that gave information to them. This reciprocity effect is even stronger in the Connecting Healthcare case.

[9] We choose not to include the odds ratio's in the main text, as they might give a false sense of precision given the nature of the models (simulation-based inference). The odds ratio indicates how much more likely someone is to give (or receive) information when the independent variable increases by 1 point. The odds ratio for each of the significant variables can be calculated by using the formula $e^{log-odds}$= *odds ratio.* As they do tell us something about the magnitude of the effects, we provide the odds ratio for the significant findings in this footnote.
CareLab: Reciprocity: $e^{1.88}$ = 6.55, freedom: $e^{0.31}$= 1.36, coordinating function (out-degree): $e^{2.16}$= 8.67, coordinating function (in-degree): $e^{1.34}$ = 3.82
Connecting Healthcare: Reciprocity: $e^{2.87}$ = 17.64, priority higher management: $e^{0.47}$ =1.60, coordinating function (in-degree) $e^{1.84}$=6.30

	CareLab	Connecting Healthcare
Model 1	Log odds (standard error)	Log odds (standard error)
Edges	-1.33 (0.14) ***	0.62 (0.18)***
AIC	***315.9***	***172.7***
Model 2		
Edges	-2.12 (0.22)***	-1.04 (0.37)***
Reciprocity	2.49 (0.47) ***	2.86 (0.65)***
AIC	***286.9***	***150.4***
Model 3		
Edges	-5.09 (1.70) **	1.36 (3.08)
Reciprocity	1.88 (0.53)***	2.87 (0.73)***
Freedom (out-degree)	0.31 (0.16)*	-0.44 (0.30)
Commitment own organization (out-degree)	-0.11 (0.09)	-0.11 (0.21)
Priority higher management (out-degree)	-0.13 (0.09)	0.47 (0.17)**
Experience (out-degree)	0.09 (0.13)	-0.23 (0.17)
Experience (in-degree)	0.07 (0.12)	0.20 (0.16)
Coordinating function (out-degree)	2.16 (0.52)***	-1.15 (0.81)
Coordinating function (in-degree)	1.34 (0.46) **	1.84 (0.71)**
AIC	***247.5***	***136.2***

Table 11. Results ERGM analyses. p-values: ***<0.001; **<0.01; <*0.05

Freedom

The results show that the perceived freedom to act as one sees fit is case dependent, as it only explains interactions in the CareLab. Representatives experiencing more freedom to act as they see best fit are more likely to share information outside meetings in the CareLab case. No such effect was found in the Connecting Healthcare case.

Commitment own organization

Commitment of the organization to continuously support the innovation is not a variable explaining interaction in the studied networks.

Priority higher management

Instead, it was found that priority of the higher management drives interactions in the Connecting Healthcare case. In other words, when the actor's perception of the priority of the higher management towards the innovation increases, the likelihood of giving information to other members of the collaborative arrangement increases as well. A similar result was not found in the CareLab case.

Experience
The results indicate that the level of experience with the problem at hand does not influence interactions in the two cases. Representatives are not more likely to share information when they are more experienced at the problem at and they are also not more likely to receive more information.

Coordinating function
Coordinators of the network have a central role in the interactions. This is especially the case in CareLab. The coordinators in this case tend to give more information and they are also more likely to receive information. An actor with a coordinating function is considerably more likely to give information outside meetings than other actors in the network. Moreover, a coordinator receives more information compared to the other actors in the network. In Connecting Healthcare, we find that the coordinator is only more likely to receive information from others because only the in-degree is significant. The coordinator in the Connecting Healthcare case is more likely to receive information from the other Representatives. Representatives having a coordinating function do not give more information compared to other representatives in the network.

5.5 Discussion and conclusion

In this study we tried to explain how the home organization of the representatives in collaborative arrangements aimed at creating an innovation influences interaction. Figure 4 summarizes the results in relation to the hypotheses.

The findings confirm the importance of the home organization to explain interaction in innovation networks, however, we found that other factors such as network structure and individual characteristics must not be overlooked. Reciprocity is one of the strongest indicators for network interactions, and being a coordinator is a factor explaining the eagerness to interact as well. Hence, the findings show that interaction is an interplay of at least network structure, the coordinating role of actor and the home organization.

In the theoretical framework, it was argued that the attitude of the home organization and its higher management plays a role in inter-organizational interaction in innovation projects. For example, previous research showed that the attitude of higher management and the freedom to act as someone sees fit are important for inter-organizational information sharing (Yang & Maxwell, 2011; Gil-Garcia & Sayogo, 2016; Maskey et al.; 2020; Urbano et al., 2022). Until now,

research on inter-organizational information sharing has mainly focused on information sharing not being in the context of developing a public sector innovation. Moreover, in innovation literature factors such as the attitude of higher management and the freedom to act as someone sees fit and its relation to innovation has only been studied in an intra-organizational context (Damanpour, 1991; Büschgens et al., 2013; Schultz Larsen, 2015; Lopes & Farias, 2020).

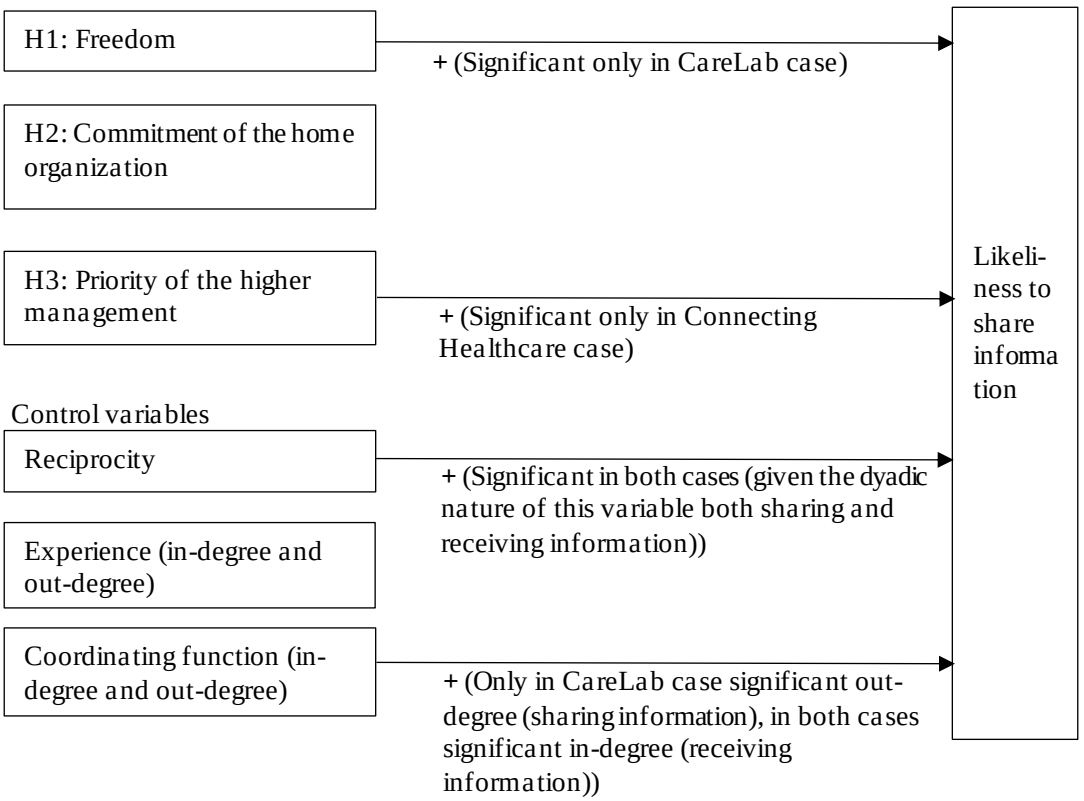


Figure 5. Confirmed hypotheses

In this study, it was found that some of the organizational conditions related to information sharing and innovative behavior also apply to the willingness to actively interact across organizational borders in collaborative innovation processes and that a tension between home organization and interaction exists under certain circumstances. In that respect, we add to the stream of literature that examines how organizational features influence the inter-organizational

information sharing and place this in the context of the development of public sector innovations and apply it to the overlooked 'between-meeting interactions'.

Looking at the significant results, reciprocity and the in-degree of the coordinator are significant variables in both cases, while freedom to act only influences interaction in the CareLab case and priority of the higher management only influences the interactions in Connecting Healthcare. A possible explanation, following from the additional interviews, might be that the representatives in the Connecting Healthcare case experience the innovation as a higher priority to develop, especially for the representatives of federal organizations. Regardless whether or not representatives felt that they were free to act as they wanted, they had no choice but to share information. There had to be an innovation; the budget was already there. Hence, actors felt obliged to share useful information. Contrary, CareLab was much more a thinking exercise on how to reduce administrative burdens in the healthcare sector with actors that voluntarily participated in the project as they were interested in the topic at hand. Hence, representatives in this case only actively participated if they had the freedom to act as they wanted. If not, they would refrain from participating as there was no clear pressure to eventually come up with an implemented innovation.

The findings suggest that representatives that are given freedom to act as they want are under certain circumstances more inclined to give information. This is a good thing from the perspective of information circulation in the collaborative arrangement to come up with innovative ideas. However, it also indicates that organizations dealing with sensitive information should be cautious concerning what their representative is sharing, how easy it is to share information, and if control mechanisms for sharing information should be taken to protect the own organization (Yang & Maxwell, 2011). The finding that priority enhances information sharing is interesting as it suggests that managers ideally prioritize the innovation. This finding has only a limited practical implication as managers can only prioritize a limited amount of projects. However, an interesting finding in this regard is that continuous support for the innovation by the management does not influence information sharing, while supportive leadership is named as one of the most prominent indicators for inter-organizational information sharing (Yang & Maxwell, 2011; Dawes & Préfontaine, 2003; Gil-Garcia & Sayogo, 2016; Maskey et al., 2020; Urbano et al., 2022). Therefore, the findings indicate that prioritizing is recommended, but the manager does not have to have to provide continuous support.

This study has several limitations. One limitation is that we treat the respondents as very rational agents, taking their cues from goals, rules, sanctions, rather than their personal attitudes, values, and existing relationships with their innovation actors. Thus, we analyzed real-world observations of policy processes from a very causal-mechanistic perspective (Van der Heijden et al., 2021). Future research should examine how these 'soft' characteristics influence sharing of information. Related, the results might be affected by confounding variables. For example, the representative's hierarchical position and its decision-power might affect both the freedom and the interactions with other actors. Moreover, a representative's communicative skills can both influence the commitment and priority of the organization as well as the interactions. The presented results give valuable insights in factors influencing interaction and are supported by the additional interviews, but future research should clarify if internal validity is fully guaranteed. Next, the findings are based on two case studies and on interactions outside formal meetings. Following from these findings, future research should examine to what extent our results are generalizable to other collaborative innovation projects and also to what extent they apply to information sharing inside meetings. Furthermore, future research should examine if the 'innovation component' in the projects has led to the rejection of several hypotheses.

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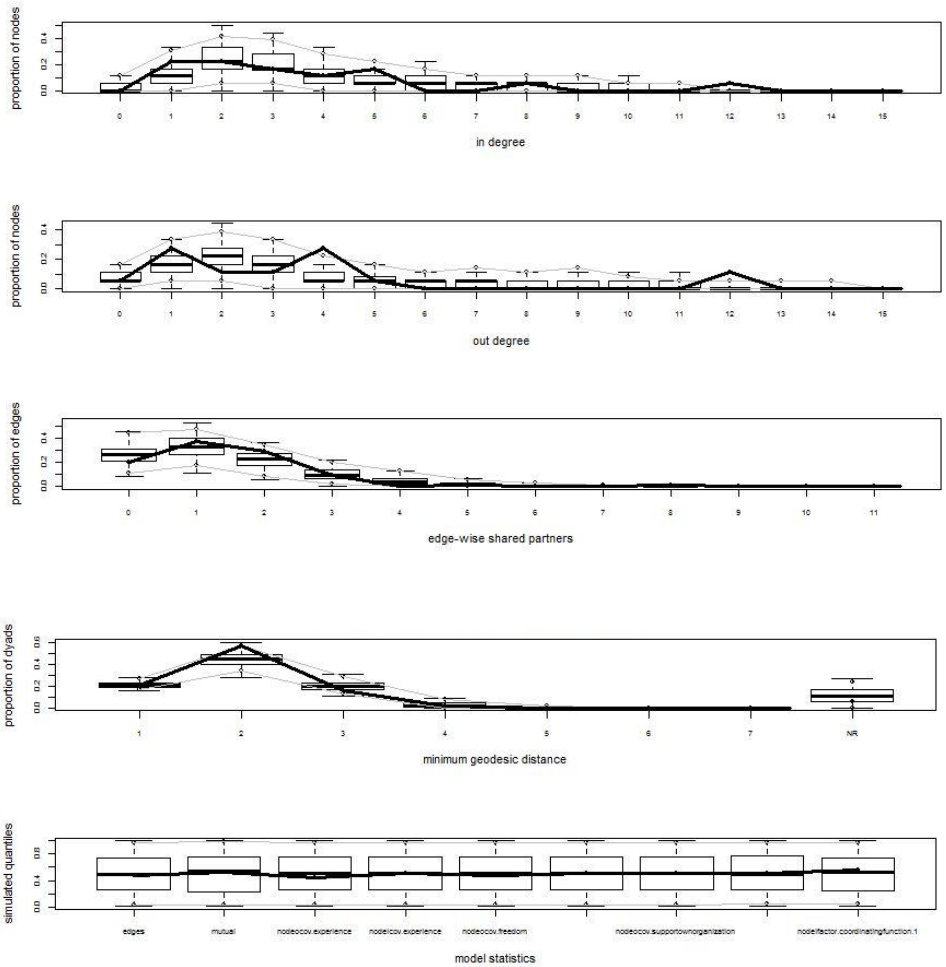
Appendix chapter 5

Goodness-of-fit diagnostics 'CareLab'



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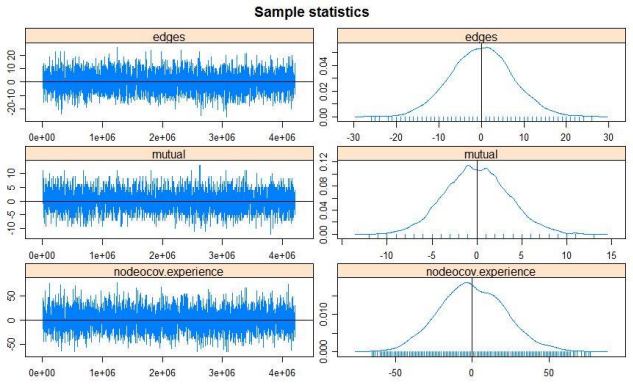
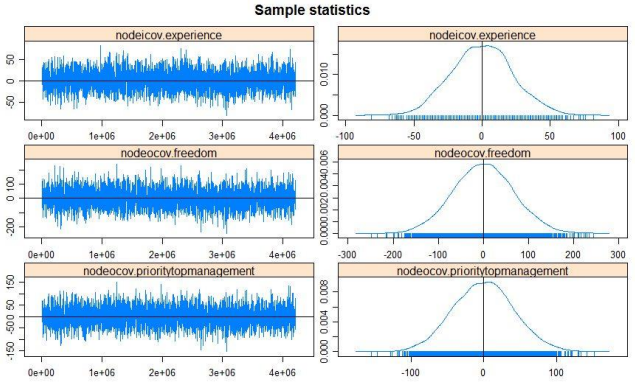
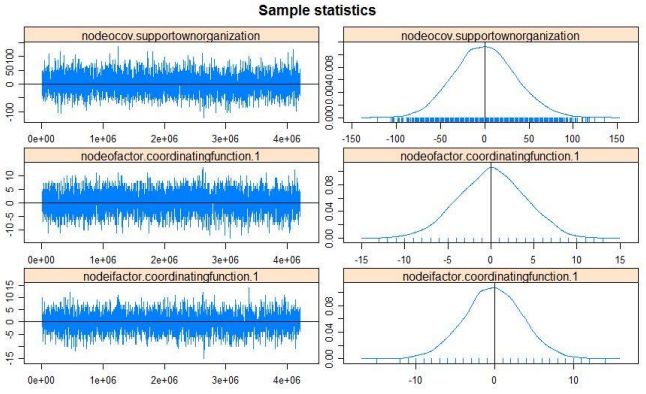
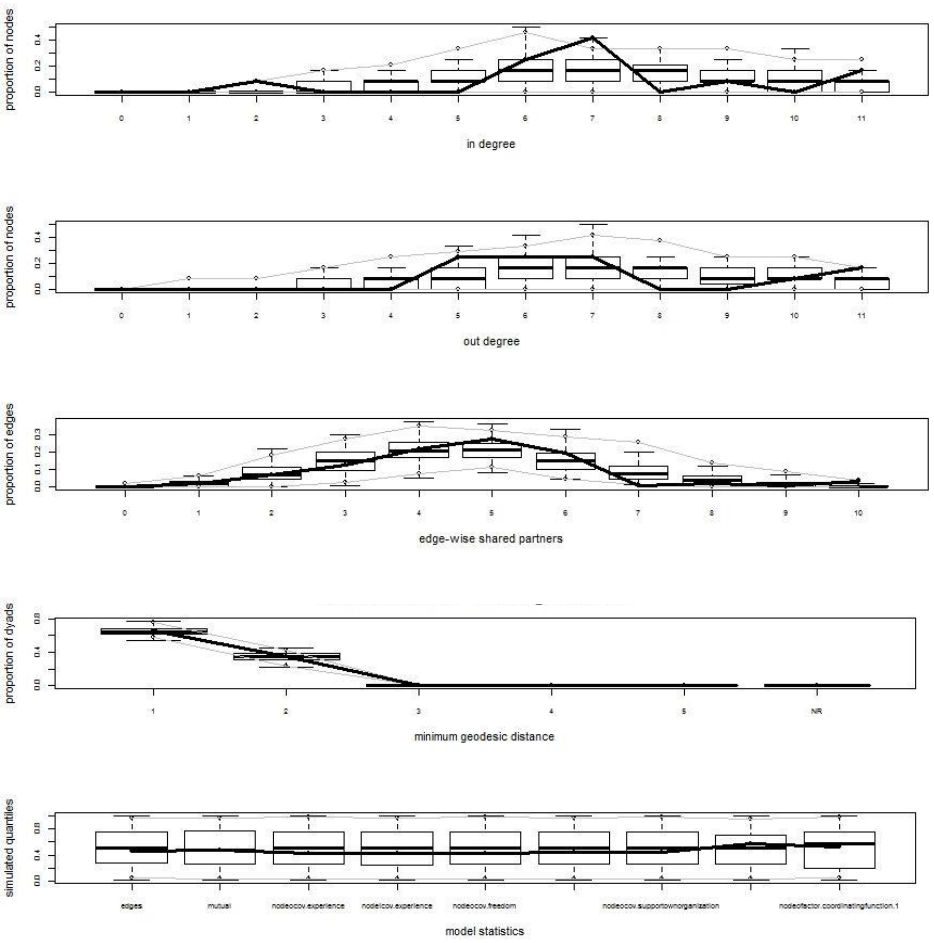






Goodness-of-fit diagnostics 'Connecting Healthcare'



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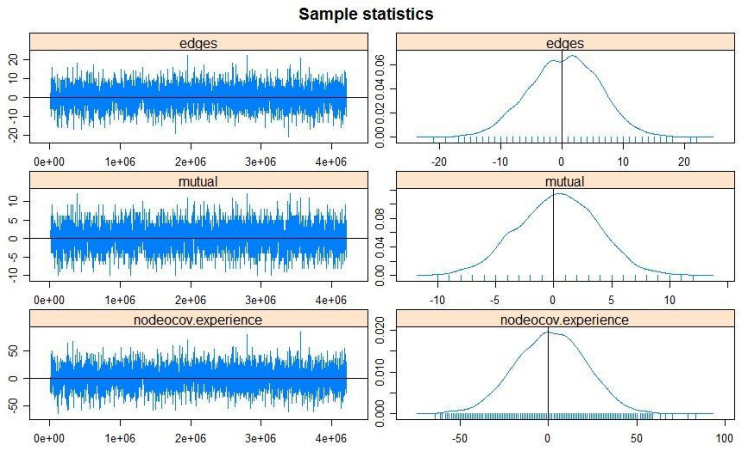

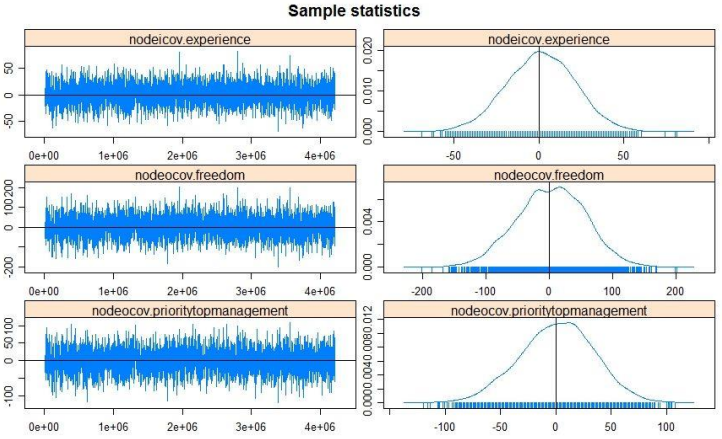

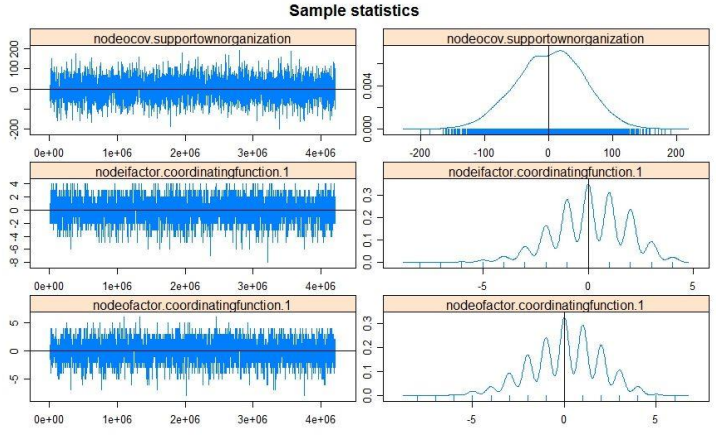

Chapter 6

Discussion and conclusion

6.1 Introduction

As has been thoroughly argued in the previous chapters, innovation is increasingly a necessary way for governments to solve societal problems (De Vries et al., 2018; Torfing, 2019; Callens et al., 2021; Dockx et al., 2022). Current complex 'wicked' problems of which not only the solution, but also the nature and extent is unknown require government organizations to look beyond their own organizational scope and to innovate as standard solutions are oftentimes not sufficiently effective to solve the problem at hand (Bommert, 2010; Arundel et al., 2019).

Hence, the process of innovating in the public sector is nowadays commonly associated with collaboration with other actors outside the own organization, because of commonly named advantages, such as gaining multiple insights in the problem at hand and the possibility of obtaining and combining resources (Keast et al., 2006; Torfing, 2019). However, as literature suggests, working together for innovation should not be regarded as the ultimate solution for achieving public sector innovation. Collaboration is also associated with problems, such as increasing complexity and misunderstandings between actors; which are to a lesser extent present when an innovation is developed within a single organization (Siddiki et al., 2017; Varda & Retrum 2015; Cinar et al., 2019). Thus, collaboration is anything but a guarantee for successful public sector innovation (McGuire & Agranoff, 2011; Wegrich, 2019, Meijer & Thaens, 2021).

For the reasons to increase the benefits of collaboration and to reduce its disadvantages, the question rose how collaboration for public sector innovation works in the best possible way. Although innovation through innovation in the public sector is receiving increasing attention in the scientific literature (e.g. Hartley et al., 2013; De Vries et al., 2018; Cinar et al., 2019; Lopes & Farias, 2020), many themes regarding collaborative public sector innovation remain relatively untouched. The purpose of this dissertation was to examine two important topics in collaborative innovation literature that deserve more attention: (1) the composition and consequent coordination of collaborative arrangements aimed at

innovation and (2) the structure of the interaction networks of these collaborative arrangements.

These topics were captured in the central research question of the dissertation: ***How do the composition and interaction structures of collaborative arrangements aimed at public sector innovation lead to innovation?***

This research question is answered in this final chapter. The main findings of the sub-research questions are presented along the lines of the two studied topics. Moreover, this chapter presents a reflection on what this dissertation contributes to the literature, as well as addressing the limitations of this dissertation.

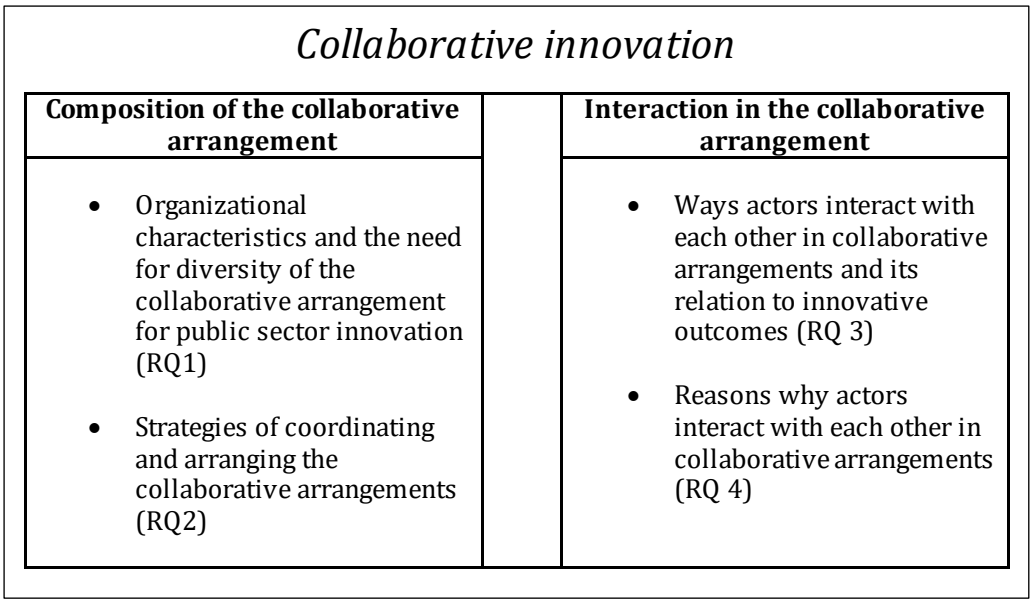

Figure 6. Conceptual framework

6.2 Composition of the collaborative arrangement

The first half of this dissertation primarily focused on arranging and the composition of the collaborative arrangements. In chapter 2, the research question relating to diversity of collaborative partners and public sector innovation was answered:

1. ***To what extent do organizational capacities to innovate and diversity in collaborative arrangements aimed at innovation lead to different types of innovation?***

The extent to which organizational capacities to innovate and diversity of public and non-public actors within collaborations result in the development of different types of innovation was examined. The results following from the survey among federal and Flemish civil servants indicated that collaboration with a diverse set of especially non-public actors benefits the development and implementation of different types of innovation. All types of innovations (policy, technological, process and service) were found to be correlated to diversity of non-public actors, while policy innovations were also correlated to diversity of public actors. Furthermore, although the results suggest that inter-organizational collaboration with a diverse set of (especially) non-public actors is beneficial for the development of public sector innovation, it was found that organizational characteristics are important as well. The organization's ability of intra-organizational learning and having sufficient innovation resources appear to be important drivers for several types of public sector innovation. This means that the organization preferably should, apart from collaborating with a diverse set of actors, also be able to learn from new insights, should have routines to acquire new knowledge, and should be able to adjust policies and routines based on this new knowledge. Moreover, sufficient innovation resources, such as financial means, innovation-oriented staff and ICT, contribute to the development of public sector innovations.

As has been mentioned many times in this thesis, the argument for collaboration to innovate consists of combining the strengths of different actors in order to achieve a better understanding of the problem, to generate new insights for solutions and consequently to have the resources to implement the chosen innovative idea (Bommert, 2010; Siddiki et al., 2017; Lewis et al., 2018; Torfing, 2019). The findings affirm the argument stating that collaboration is beneficial for the development of innovation.

Moreover, the findings shed light on the diversity in these collaborative arrangements. In chapter 2 it was mentioned that research on the effect of diversity on the development of innovations is scarce. Research focused either on diversity within an organization (Bouncken et al., 2016; Demircioglu, 2020; Mothe & Nguyen-Thi, 2021) or on differences in the goals, perceptions, capacities, power, and the cultures, and practices of collaborative partners (Corsaro et al., 2012; Siddiki, et al. 2017). Research on diversity of the types of collaborative partners in relation to the type of innovation was lacking. By answering this research question, it cannot only be concluded that collaboration indeed stimulates public sector

innovation, but also that this collaborative arrangement should ideally consist of a wide variety of non-public actors to stimulate the development of policy, technological, process and service innovations.

However, the findings also indicate that collaboration should not be regarded as the ultimate solution for developing public sector innovations. For example, the results show that diversity concerning public actors only spurs policy innovations and organizational characteristics concerning intra-organizational learning and innovation resources are a strong indicator for innovation as well (see also: Gieske et al., 2019).

Still, the findings underline the positive effect of collaboration on public sector innovation. Hence, in chapter 3 it was examined how collaborative arrangements aimed at innovation are established and managed and therefore followed up on the findings of chapter 2. As those findings indicate that a diverse group of actors spur the development of different kinds of public sector innovation it was examined how coordinators arrange the composition of collaborative arrangements aimed at innovation. The following question was answered based on the theoretical stance that the establishment of synergy is a crucial element for the development of innovation (Lasker et al., 2001; Cramm et al., 2012; Bressers, 2014: 103):

2. ***How do coordinators compose collaborative arrangements aimed at innovation for the promotion of synergy concerning idea generation and implementation?***

The findings of the case studies showed that the benefits of collaboration with a diverse set of actors are certainly there, just as was found in chapter 2. However, the findings in chapter 3 added more nuance to these findings and demonstrated, just like can be found in the scientific literature, that collaboration can also lead to an increased risk of misunderstanding and conflict (Siddiki et al., 2017; Varda & Retrum 2015; Cinar et al., 2019).

It was found that the way in which the collaborative arrangements aimed at innovation are arranged varies quite a bit although two clear ways of arranging were distinguished which relate to the steps of the 'innovation cycle' (idea generation, idea selection, implementation, dissemination) (Sørensen & Torfing, 2011). The comparison of eight different case studies showed a clear difference between the selection of actors for 'idea-oriented' projects on the one hand and

'implementation-oriented' projects on the other. The results indicate that the activities of the coordinator depend to a large extent on whether the collaborative arrangement is composed to generate innovative ideas ('idea-oriented' projects) or whether the final innovative solution to the problem is already more or less known ('implementation-oriented' projects). It was found when composing the collaborative arrangement, coordinators commonly tend to focus on just one phase of the innovation process at a time: idea generation or implementation. As a result, we see that the innovation processes are balancing between two phases (idea generation and implementation) that each require a different approach of arranging the collaborative arrangement.

When the project is very much 'idea-oriented' and is (still) focused on the creation of innovative ideas, synergy is primarily tried to be established by gathering intangible resources by a network that is formed from scratch based on pull factors, such as the chance of thinking along for an innovative solution. As a result most of these projects expect little commitment of participating actors and they pay little attention to including actors who can block the process or help the process forward.

In contrast, synergy for implementation is especially established in predetermined collaborative arrangements in which the network coordinator directs the predetermined actors towards an already chosen innovative idea. The results of the comparison showed that when a project is very much implementation-oriented, synergy is created primarily by grouping complementary tangible and intangible resources of a more or less already existing group of actors that are pushed to the process based on the nature of their organization. The collaboration process is in that case also less based on joint interaction with each other, but usually on a central coordinator asking an already existing group of actors to make their resources available to the project. The network coordinators substantively focus less on active interaction between all actors to achieve cross-fertilization of perspectives, but rather on guiding actors in the most effective way possible to the implementation to the predetermined innovative idea.

The findings in chapter 3 tell us that actors were often involved in the process on the basis of their importance for the specific phase in which the innovation process is currently at, which is line with resource dependency theory (Scharpf, 1978; Pfeffer & Salancik, 1978; Hillman, Withers and Collins, 2009). Actors who can provide different points of view towards the problem at hand are involved in the idea generation phase and actors that are important for implementation are

involved in the implementation phase of the project. It was found that little consideration was given to the other phases of the project other than the phase the process was currently in. For example, actors being important for implementation oftentimes did not seem to be involved in the idea generation phase. As a result, actors who can block the process or, on the contrary, realize the innovation, are oftentimes not included in the decision-making on the innovation they should realize or support.

The aforementioned findings indicate that diversity in collaborations is important and that the phase of the innovation project determines how coordinators include different actors in the collaborative arrangement aimed at innovation. It shows that composition of the collaborative arrangement is one important part of collaborative public sector innovation and deepens the existing body of literature that emphasizes the need for collaboration when innovating (e.g. Torfing, 2019; Bommert, 2010; Lewis et al., 2018). It tells how collaborative arrangements are established and what kind of actors are (or: should be) included. Still, it tells little on the way these actors interact with each other once they get together.

To that end, the network structure was examined.

6.3 Network structure and interactions

Whereas the first part of this dissertation emphasized the composition of the collaborative arrangement, the second part focused on how and why the representatives in the collaborative arrangement interact with each other once they have been brought together. Hence, the second part of this dissertation concerned the network structure of the collaborative innovation arrangements and the interactions among representatives. In this second axis, it was examined to what extent the network structure of innovation projects are associated with positive outcomes, and consequently what explains why representatives decide to interact with each other (and therefore why the network structure looks the way it does). As some actors are found to be more important than others in collaborative processes (Scharpf, 1978; Pfeffer & Salancik, 1978; Hillman et al., 2009), the following question was answered in chapter 4:

3. ***How can innovative outcomes of collaborative public sector innovation projects be explained by the network integration of its most important actors ?***

In this study builds upon the theory concerning clique overlap as most effective way for information flow in collaborative arrangements (Provan & Sebastian,1998). It was found that the innovative outcomes can (partly) be explained by the structure of the different networks. It adds to the literature that connects network structure with network effectiveness (e.g. Provan & Milward, 1995; Provan & Sebastian, 1998; Raab, et al., 2015; Cepiku et al., 2020; Stevens, 2018). These studies acknowledge that the network structure is important for realizing effective network outcomes, however they are either not exclusively focused on innovative network outcomes, nor the integration of certain (important) actors. To date, the role of the integration of the most important actors in the networks was not studied, while research did suggest that on the one hand, network position of certain main actors (such as the coordinators) lead to more effective outcomes (Raab et al., 2015) and on the other hand, that actor importance is associated with innovative outcomes (Stevens, 2018). Using social network data of three innovative cases it was found that actors of successful cases are better connected with each other through clique overlap when they share information outside official meetings. Moreover, the most important actors are more dispersed throughout the network in successful cases and connect the entire network with each other. This observation is only to a limited extent also found for interaction during official meetings.

Furthermore, actors in successful projects are better connected with each other outside official meetings through more and larger clique formation, and clique overlap integration. This finding indicates that clique overlap is associated with innovative network outcomes, which is in line with the milestone studies of Provan and Milward (1995), Provan and Sebastian (1998) and Turrini et al., 2010. However, unlike what these studies argue, representatives do not necessarily always have to be well-connected through clique overlap as this observation was not found in the most successful case when looking at the network concerning elaboration upon each other's ideas inside meetings. As argued in chapter 4, this might be due to the phase of the innovation process (Sørensen & Torfing, 2011). The most successful case was more implementation-oriented which might indicate that representatives did not need to be tightly connected within official meetings as all representatives have their own specific task and therefore did not have to elaborate upon each other's ideas. In other words, there was no real need to build upon each other's ideas as the end goal and the way to reach it was more or less known already.

This study shed light on the interactions in collaborative public sector innovation projects, but did not examine why actors are more likely to interact with others. For that reason, these findings begged for a follow-up question explaining why innovation networks take the shape the way they do and thus what drives interaction in innovation networks. Hence in chapter 5, the following question was answered:

4. ***To what extent do the actors' home organization influence the interactions in collaborative arrangements aimed at innovation?***

Special attention was paid to the actors' home organization as the sometimes closed character of governmental organizations and the reluctance of sharing information with external actors (Cinar et al., 2019; Bommert, 2010), raises the question to what extent the organization provides the conditions for their representatives to interact with the representatives of other organizations. It was found that the coordinators share significantly more information in the innovation networks and sometimes also receives more information. It was also found that representatives often share information with another representative if the representative also receives information in return. This 'reciprocity effect' is one of the most important explanations of interaction in innovation networks. It show that innovation networks are highly driven by bilateral contact between representatives. When a representative shares information, the chance is high that the representative will also receive more information, indicating that the same representatives share information with each other.

Moreover, it was found that the home organization of the representatives determines how representatives interact with each other. The analyses show that the priority of the home organization towards the innovation plays an important role in interacting in the innovation networks. In one case study, it was found that the priority for the innovation of the higher management is a reason for information sharing. If a representative in the network feels that the higher management is prioritizing the innovation, the representative is more eager to share information. In another case study, it turned out that the freedom a representative experiences has a positive influence on the degree of interaction. When a representative feels free to do as he or she thinks is best for the innovation process, the representative is more inclined to share information.

In sum, the main conclusions of this dissertation are:

- (Especially non-public) diversity is important for the innovation process, but its appropriateness depends on the type of innovation and its phase.

- Collaboration with a diversity of many actors is a tool which is mainly used when an innovative idea still has to be developed. Interactions happen in large plenary sessions in which many actors are welcomed and preferably heard. As soon as the innovation idea is selected, collaboration becomes particularly important for exchanging resources that enable implementation. Consequently, interactions are at that point commonly bilateral with the goal to 'get things done'. Network coordinators need to be able to take these different steps of the innovations cycle in mind and act accordingly.

- The way actors interact with each other affects the outcomes of the process. Clique overlap is associated with innovative outcomes, especially concerning information sharing outside official meetings, but collaborative arrangements do not always have to be well-connected through clique overlap. This might be due to the nature and phase of the innovation project.

- The role of the underlying home organization should not be underestimated. Characteristics such as the learning capacity of the organization, the priority of higher management and sufficient innovation resources are an important stimulus for (interactions in) collaborative innovation projects.

Table 12. Main findings

6.4 The added value of this dissertation to the field of public sector innovation

The previous paragraph already mentioned some of the contributions of this study to the scientific literature on public sector innovation. From a scientific stance, this study has several important unique features. The current debate on public sector innovation through collaboration oftentimes seems to either focus on the argument claiming that innovation processes benefits greatly from collaboration with other actors (e.g. Siddiki et al., 2017; Torfing, 2019). However, other authors point to the complexity that collaboration brings and how it can complicate the innovation process (Cinar et al., 2019; McGuire & Agranoff, 2011; Wegrich, 2019, Meijer & Thaens, 2021).

These two perspectives are combined in this dissertation and are not regarded as opposites of each other. This dissertation rather examined when and how collaboration works best in innovation processes and when and how collaboration is less appropriate. As a result, this dissertation provided the broad concept of 'public sector innovation through collaboration' with nuances and new insight on underlying key indicators .

6.4.1 The types of collaborative partners

This dissertation began with the notion of the increasingly accepted view that innovation is best achieved through collaboration. Torfing (2019) is one of the most recent works to comprehensively describe the most prominent arguments for collaborative public sector innovation. His arguments in favor of collaboration when innovating largely correspond to the much cited work of Bommert (2010). The results of this dissertation support to a large extent their line of reasoning that collaboration with a diverse set of actors stimulates public sector innovation. All chapters provide new insight on the types of collaborative partners. Chapter 2 is one of the first studies to link diversity of the collaborative arrangement to different types of innovation using a unique set of data coming from high level civil servants/managers; in chapter 3 it was examined how different actors are pulled or pushed towards innovation processes to create synergy. The results in chapters 4 and 5, give new insights on what types of actors collaborate with each other, why they do so, and how this is related to innovative outcomes.

The findings of chapter 2 show that especially diversity of actors that operate outside the government administration stimulate the development and implementation of public sector innovations. Moreover, as we did not find any negative relation between diversity of collaborative actors and innovation, we can confirm that collaboration with a diverse set of actors is indeed beneficial for public sector innovation (Bommert, 2010; Sørensen & Torfing, 2011; Siddiki et al., 2017; Lewis et al., 2018; Torfing,2019). An important contribution of this dissertation is that it shows that all types of innovations are helped by (especially non-public) collaboration which is an important refinement to the current state of the art.

6.4.2 The different phases in the innovation process

Unlike many other studies, chapters 3 and 4 explicitly distinguished between the different phases of the innovation cycle. In doing so, this thesis has offered new insights into when collaboration can best occur and in what way, but also how

actors in different phases interact differently and what possible consequences this has on innovative outcomes.

The qualitative case studies in chapter 3 confirm that coordinators of collaborative arrangements oftentimes apply the same line of reasoning cited in the literature. That is, the innovation process should be opened in order to share internal knowledge with others and thus to achieve a synergetic relationship that is greater than the sum of the individual parts (Ansell and Torfing, 2014; Stevens & Verhoest, 2016; De Vries et al., 2018; Torfing, 2019).

However, it was found that the benefit of opening the process is highly dependent on the phase of the innovation process and the 'anything goes' principle of adding actors to the innovation process often proves to be more nuanced in practice. When the innovative ideas still have to be generated, any insight is highly valued, especially to innovations that affect the citizen or other actors outside the governmental administration. In these innovation processes, a process of co-creation takes place in which, roughly speaking, any additional insight is valued and admitted to the process. Contrary, implementation happens with a much more selected (pre-determined) group of actors and more based on predetermined one-on-one interactions (see also chapter 4 on clique overlap). Therefore, this dissertation adds the important nuance to the current state of the literature that collaboration (both with how many actors as with whom) is very much dependent on the phase of the innovation process.

6.4.3 Combining the types of collaborative partners and phases

If these findings are linked to the findings of the federal and Flemish survey data (chapter 2), this dissertation is able to deepen the results about the possible effectiveness of diversity in the collaborative arrangements. The results from the federal en Flemish data show that diversity of non-public actors is important for the development of all types of innovations. However, the findings of the survey data (chapter 2) lacked the context that the case studies were able to provide (chapter 3). Contrary, the survey data also provided additional insights in the case studies. Two lines of reasoning can be derived from the findings from the federal and Flemish survey data in relation to the case studies.

On the one hand, the findings from the case studies of chapter 3 provide more context to the survey's findings. A high amount of collaboration with non-public actors can be observed in the case studies when the process is still in the idea

generation phase. This finding might indicate that non-public diversity is particularly desirable during the development of innovations during the idea generation phase. As the survey data does not take the different steps of the innovation cycle (Sørensen & Torfing, 2011) into account, the case studies provide context to the results of the federal and Flemish data and might indicate that non-public diversity is especially important when ideas still have to be generated. Future research should examine whether diversity of the collaborative arrangement is related to specific phases of the innovation process.

On the other hand, the results of the federal and Flemish data (chapter 2) might indicate that coordinators of the case studies (chapter 3) do not optimally coordinate the collaborative arrangements in terms of adding actors to the process. The case studies show that collaboration in innovation processes that mainly concern internal governmental affairs is much more an 'internal government affair' and often limited to a select group of actors who are directly involved in the issue and therefore not everyone is able to participate. However, based on the survey data, it can be argued that these collaborations might be more effective when they are developed in a collaborative arrangement with more non-public actors. Again, future research should examine whether diversity of the collaborative arrangement is desirable in all steps of the innovation process.

To conclude, concerning the composition collaborative arrangements, the findings of this dissertation support the literature claiming that collaboration for innovation is beneficial for the development of public sector innovation (e.g. Siddiki et al., 2017; Lewis et al., 2018; Torfing, 2019). Still, especially the case studies and its insights into the difficulties in coming to a joint ownership when a large variety of actors are introduced to the process tell that the literature that has a more critical stance towards collaboration for innovation (e.g. Varda and Retrum, 2015; Cinar et al., 2019; Wegrich, 2019) should definitely not be neglected. A large contribution of this dissertation concerning the creation of collaborative arrangements is that is provides more insights about when and how collaboration for innovation is appropriate; both concerning the type of collaborative partners, the type of innovation (as distinguished by Gieske et al., 2019) and the phase of the innovation process (Sørensen & Torfing, 2011). Unlike other studies, this dissertation makes a clear distinction between the different types of actors, and the different phases of the process, but also to different types of innovation. For example, chapter 2 in which the drivers for different types of innovation are examined (with a special focus on diversity) or chapter 3 in which different types of innovation are

examined. Systematically comparing different types of innovation with each other within the same study does not happen often as studies commonly tend to focus on one type of innovation (e.g. Hughes et al., 2020; Simmons & Brennon, 2017).

Therefore, it is possible to make claims about the diversity of the collaborative arrangements for different types of public sector innovations (policy, technological, service, and process innovation), but also when this diversity occurs (idea generation versus implementation).

In conclusion, the results of this dissertation support the line of reasoning acknowledging the added value of diversity in collaborative innovation arrangements, but adds important nuances, ánd areas of further investigation, to the how, with whom and when of diversity in collaborative arrangements.

6.4.4 The network structure

Solely bringing together actors usually does not result in effective innovative solutions. Hence, the way the actors behave within the collaborative arrangement once they have been brought together is an important field of study. This dissertation is one of the few studies that examined how clique formation (based on information sharing between actors) is associated with innovative outcomes. Not only does this dissertation describe how actors interact with each other (see chapter 4), it also examines why they do so (see chapter 5). This dissertation therefore provides a thorough analysis on the way actors interact with each other, what structures are preferred and what conditions stimulate interaction. When looking at network structures, this thesis makes an important contribution to the scientific literature on network structure and innovation processes. Provan and Milward (1995) and Provan and Sebastian (1998) initiated the study of network outcomes based on network structure. This thesis took an important conclusion from these works, being that cliques and clique overlap are important indicators of network outcomes, and applied it to innovation networks. In this way, old findings were applied to the currently highly relevant topic of collaborative public sector innovation and it was to some extent confirmed that clique overlap is related to innovative network outcomes.

The contribution of this dissertation is that it is one of the few studies that examines clique overlap in two interaction networks within the same case and with the notion of actor importance (Raab et al., 2015; Stevens, 2018). By comparing interaction networks both inside as outside official meetings, it was shown that in

successful cases most actors are a member of a clique and these cliques overlap especially during information sharing outside official meetings. Moreover, the most important actors have a central role in these interaction networks. These findings emphasize the importance of the network structure, especially outside meetings.

With this finding the importance of interaction outside official meetings is acknowledged, and it emphasizes that innovation processes do not end when official meetings end. As clique overlap concerning elaboration upon other's ideas inside meetings showed less clear results concerning innovative outcomes, future research should examine under what conditions clique overlap inside meetings is especially important. For example, the findings of the case studies (chapter 3) suggest that interaction patterns in the implementation phase are to a higher extent one-on-one, while interactions in the idea generation phase should best involve interaction with (almost) everyone in the collaborative arrangement.

Still, the findings on clique overlap do indicate to some extent that representatives should be well-connected to create a process in which information flows well through the network. Something which was also found in chapter 3 of this dissertation. As information (and resources) reach the actors well when they are properly connected, a process of synergy can arise (Lasker et al., 2001; Ansell & Torfing, 2014). Moreover, the chance of actors feeling excluded or not involved in the decision-making process is considerably smaller if all the actors are well-embedded in the collaborative arrangement. Future research should determine if, how and in what phase actors need to be connected through clique overlap as it enables coordinators of collaborative innovation processes to improve the network structure even more.

From this point of view, it is therefore necessary that within the collaborative arrangements attention is paid to the circumstances in which the actors find themselves. More specifically, is the innovation a sufficient priority for the home-organization and does the representative get enough freedom to do what is best for the innovation?

6.4.5 The role of home organizations

Following for this, apart from these network level conclusions, this dissertation has also shown that organizational characteristics play an important role in collaborative innovation processes. The question in the introduction was posed whether public sector innovation is a matter of individual 'innovation heroes',

whether the development is mainly an 'in-house' activity or if innovations are best developed in active collaboration with others outside the own organization? At the end of this dissertation, it is possible to argue that collaborative innovation is an interplay of both the individual, the organization and the network. Chapter 5 explicitly studied the extent to which the home organization of the representatives plays a role in the interactions between actors. In doing so, this study connects network analyses with organizational characteristics of the actors involved; something which is still rare in the literature on innovation through collaboration.

As argued in this discussion, inter-organizational collaboration certainly benefits the development of public sector innovations, but characteristics of the home organization and how they influence the way individual representatives interact should certainly not be overlooked. Representatives are more inclined to interact with other actors when they feel more freedom to do what they think is best for the innovation process as well as when higher management gives more priority to the innovation. The findings show that factors that stimulate the development of innovations inside organization also influence inter-organizational innovation processes.

This was also examined in chapter 2 in which it was found that organizational characteristics such as sufficient innovation resources and intra-organizational learning capacity influence the development of collaborative innovations. This dissertation has thus shown that many factors that stimulate innovation within the organization are also important for interaction for innovation with external actors. It can thus be said that it pays off for organizations to develop these characteristics because it is a success factor for innovation both for 'in-house' innovations (as previous research has shown) and for collaborative innovations (as this thesis shows).

6.5 The added value and limitations of the used research methods

Besides the theoretical added value of this thesis, the added value lies also certainly in the research techniques. The results in this study are based on data that were mostly collected at a managerial level. For example, the survey data of chapter 2 only includes respondents working at the two highest management levels of the Belgian federal and Flemish government. As a result, a unique set of data from hard to reach respondents such as heads of ministries (for example secretaries general) and other large governmental agencies was used. Therefore, the findings show

unique insight in innovations that are large in scale and commonly cover the whole country or autonomous region (Flanders or Wallonia).

Moreover, the respondents in the case studies were asked to participate in two ways: 1) by participating in an interview and 2) by filling out an online survey. Hence, both qualitative as quantitative data was collected for all case studies which resulted in a very rich dataset.

This dissertation demonstrates a high variety in research designs as a result of this thorough data collection. The studies include qualitative (chapter 3) but also quantitative research techniques (chapters 2, 4, and 5); each study has a different way of data collection and analysis (tobit regression, clique analysis and ERGMs). This combination of different techniques allowed that findings of one study could be deepened by applying other ways of analysis in the subsequent studies. For example, the results of the qualitative study, as presented in chapter 3 could be deepened by the quantitative network analysis presented in chapters 4 and 5. Moreover, results of the large scale survey in chapter 2, could be validated and deepened by the case studies in chapter 3, 4 and 5. This way a deep understanding of the studied case studies could be obtained.

This dissertation contains some general limitations[10]. Three of four studies are multiple case studies. Although much value can be attached to case studies (see for example Flyvjberg, 2001 concerning the power of case studies in social sciences), the generalization to other contexts remains limited. This leaves the question whether certain antecedents for innovation were specific to one case or not, and if so, what made it that the effect could only be observed in that specific case. As should be clear at the end of this dissertation: No innovation process is the same. Therefore, although both qualitative and qualitative data of all cases was obtained, it remains hard to generalize findings.

In addition, an attempt was made to compare cases with each other. However, every collaborative innovation processes is different and each has its own complexity. For example, this dissertation has for the sake of a comparison often classified the cases into idea generation, idea selection, implementation and dissemination. However, almost all scholars will argue that steps in innovation processes are intertwined, and that processes are commonly characterized by two

[10] The study-specific limitations have been discussed in the respective chapters already.

steps forward, one step back. Therefore, the results might sometimes appear somewhat 'binary' (for example, a project being either idea oriented or implementation-oriented). Although this choice and generalization can be justified, nuances have sometimes been lost that would have been addressed if all cases could be discussed in full detail.

Another limitation is the possibility of biases towards the innovation processes as the innovation projects were not evaluated using objective measures (such as realized cost savings). In the case studies, we spoke with actors who were directly, actively involved in the innovation process. This can result in actors having a biased perception of the success of the process. Someone who has invested a lot of time and resources in the process may have a different perception of the outcomes than someone who has only followed the process from a distance. Although it was tried to deal with this possible bias by assessing the cases in three ways: through interviews, by letting actors fill out a survey, and by analyzing official reports, it cannot be guaranteed that the actors who are directly involved in the process assess the innovative outcomes differently than the actors who were not actively involved and were not included in the analyses. Since the same method to determine the innovative outcomes was used in all cases, it can be argued that it was possible to come to a comparison of the level of success of the different projects.

6.6 Some last words

Ironically, the tendency to innovate sometimes seems to have become a standard response to solve societal problems. Overly ambitious managers or politicians saying "Let's innovate! Who can be against innovation?" Innovation sometimes seems like a simple solution to everything. With this dissertation I wanted to shed some light on the complex processes concerning public sector innovation to examine what this 'buzz word' entails in practice.

At the end of this dissertation I am convinced that public sector organizations can achieve great things by innovating and sometimes it really is the only solution to a problem. However, as this dissertation demonstrates, collaborative innovation projects require excellent coordination as the projects constantly need to balance between adding the right actors at the right time in the process and having the right conditions for interaction. And these are just some of the many factors at play. The risk of failure is significant. Hence, the process to come to a successful innovation should not be underestimated and should certainly not be a standard response to

every problem. This dissertation demonstrates that public sector innovation through collaboration is not a simple key to success. Hopefully the findings contribute to a better understanding into the difficult processes when managers or politicians decide to collaborate for innovation, so more innovation projects will become successful. And as more projects are successful external actors will most likely remain prone to invest time and resources in future innovation projects. Because ultimately, public sector innovations remain crucial to answering the challenges of today's complex society

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Annex: Author statement

The research presented in this dissertation stems from the inter-university research project 'Public Sector Innovation through Collaboration' (PSI-CO). In this research project, five universities (UAntwerpen (coordinator), KU Leuven, Université Catholique de Louvain, Université de Liège, and Universiteit Utrecht) conducted research on public sector innovation to advise the Belgian federal government through reports, workshops, conferences and presentations. As a result, the articles in this dissertation are to a greater or lesser extent the result of collaboration between different researchers. This dissertation was written under supervision of Prof. dr. Koen Verhoest.

Chapter 1

Chapter 1 is the introduction of this dissertation. The topic of this dissertation is highly influenced by the PSI-CO-project. Koen Verhoest coordinated this project and hired Tom Langbroek as PhD-student to work on this project. Throughout the years, Tom and Koen discussed the content and direction of the dissertation regularly. Moreover, the annual meeting with the doctoral committee provided guidance on the direction of the dissertation. This specific chapter was entirely written by Tom. Koen provided regular feedback on the contents.

Chapter 2

This chapter was written based on the federal survey that was developed for the PSI-CO project. The main concept of the paper was developed by Tom Langbroek and Koen Verhoest. The theoretical framework was developed and written by Tom, with theoretical suggestions by Koen. The survey consisted of multiple parts to measure different concepts. Concepts which were included in the survey, but which were not used in this chapter, such as New Ways of Working, were introduced by researchers from the partner universities of the PSI-CO project. The concepts related to this chapter, such as intra- and inter organizational learning, were developed based on theory suggested by Tom with additions and feedback of Koen. The composition of the survey was decided upon in collaboration with the partner universities, but the UAntwerpen team (Koen and Tom) took the lead and coordinated the process. A pilot study of the survey was executed by Tom and Emmanuel Dockx among several public servants coming from Koen's professional network.

Data gathering on the federal level was coordinated by Koen who also did the negotiations to get access, and made this possible with the help from one of Koen's contact persons at the Federal Public Service Policy and Support who could provide the contact details of the top management of the Belgian federal government. Tom made the survey (both federal as Flemish) ready for use in the online tool Qualtrics. As we were not allowed to have the contact details in our possession, the distribution of the survey and sending out reminders took place at the Federal Public Service Policy and Support and was done by Tom (sometimes accompanied by Koen) under supervision of Koen's contact person. The data collection on the Flemish level (of more or less the same survey) was done by Emmanuel Dockx and a researcher from a partner university under coordination of Koen. Koen and Emmanuel also negotiated access to the contact addresses at Flemish level. The analysis of the data was done by Tom. He consulted colleagues from his department what analysis he could use best. The final choice of variables to include in the models was made by Tom after consultation with Koen.

All texts in the chapter are written by Tom. Koen provided feedback on multiple occasions.

Chapter 3

The broader concept of this paper (collaborative arrangements aimed at innovation) was developed by Tom Langbroek and Koen Verhoest. Tom decided to center on the concept of synergy and came up with the research question and wrote the theoretical framework. The data was collected in the light of the PSI-CO project. An interview guideline was developed in collaboration with the partner universities; in which each university was responsible for their 'own concepts'. The interview questions for the conceptualization on 'metagovernance' and 'synergy' were developed and introduced by Tom and Koen.

The UAntwerpen team was responsible for the data collection of three out of eight cases. The contact persons for these cases stemmed from Koen's professional network. Koen accompanied Tom Langbroek to the first meeting with the metagovernor of each of these cases. Subsequently, Tom planned and conducted a total of 30 hour-long interviews with the most prominent actors in the cases. He was assisted by a French speaking researcher from a partner university during the few times respondents did not speak Dutch.

Interviews were transcribed with the help of student-assistants; Tom also transcribed some Dutch-spoken interviews conducted by the native French researchers of the partner universities. Analysis of the interviews was done by Tom and all texts (introduction, theoretical framework, methodology, conclusion etc.) of this chapter were written by him. Koen provided multiple rounds of feedback on fundamental issues, such as narrowing down the object of study and readability.

Chapter 4

The broader concept of this paper (examining interaction patterns in collaborative arrangements aimed at innovation) was developed by Tom Langbroek and Koen Verhoest. The idea to execute a clique analysis was coined by Tom, based on the gap in the literature he noticed, and was discussed with Koen. Again, the chapter was written in the light of the PSI-CO project. The core of this chapter are two social network questions. These questions stem from a larger survey used in the PSI-CO project, coordinated by UAntwerpen. The specific social network questions were developed by Tom, Koen and Vidar Stevens (a former colleague). Data in two of the three cases were collected by Tom; data in the third case was collected by the researchers from KU Leuven. For all cases, Tom made the survey for all cases ready for use in the online tool Qualtrics. Tom executed the analysis, and interpreted and reported the results.

All texts in this chapter (introduction, theoretical framework, methodology, conclusion etc.) are written by Tom. Koen provided input on some parts and all parts were given extensive feedback on multiple occasions by him, especially in terms of theoretical framework, readability, presentation of results and argumentation. Revisions were handled jointly.

Chapter 5

Again, the broader concept of this paper (examining interaction patterns in collaborative arrangements aimed at innovation) was developed by Tom Langbroek and Koen Verhoest as they wanted to write a paper using the ERGM method and based on the SNA data they jointly developed. This was influenced by the work of Vidar Stevens, who used this method in his PhD dissertation as well. Tom came up with the idea to look at organizational conditions to explain interactions, which was discussed with Koen. Koen provided ideas and input for the theoretical framework. Data was gathered using the same survey as used in chapter 4. Two cases were used in this study; the case selection was done in consultation with Koen. Data in one case was collected by Tom, data from the other

case was collected by the researchers from KU Leuven. The analysis was done by Tom. Koen provided regular feedback on the analysis (such as which variables and networks to include). All texts were written by Tom (introduction, theoretical framework with input from Koen, methodology, conclusion etc.). Koen provided extensive editing and feedback on multiple occasions and both authors jointly handled reviewers' feedback.

Chapter 6

Chapter 6 is the conclusion of the dissertation. The text is written by Tom. Koen Verhoest and the doctoral committee provided feedback issues like structuring this chapter and argumentation, and the content of the chapter is influenced by the numerous meetings and feedback provided by Koen in the past years.

Moreover, Tom Langbroek was a co-author for the following published journal articles:

- Dockx, E., Verhoest, K., Langbroek, T., & Wynen, J. (2023). Bringing together unlikely innovators: do connective and learning capacities impact collaboration for innovation and diversity of actors?. Public Management Review, 25(6), 1104-1127.
- Dockx, E., Langbroek, T., & Van Dijck, C. (2020). Innovatieprocessen in de Vlaamse overheid doorgelicht. *Vlaams tijdschrift voor overheidsmanagement/Vlaams Instituut voor Overheidsmanagement.-Brugge, 1996, currens*, *2020*(4), 7-23.

About the author

Tom Langbroek (Vlaardingen, the Netherlands, 1990) holds a research master's degree in Public Administration and Organizational Science from Utrecht University. He is interested in issues regarding inter-organizational collaboration to enhance government functioning in innovative ways. Alongside his academic activities, he is a senior policy officer for the 'COVID-19 Information and Coordination' department of the Dutch ministry of Health, Welfare and Sport.