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Investigating co-creation in public service innovation contexts

A configurational approach

PhD Innovation in Services in the Public and Private sectors (INSEPP)
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- a configurational approach -

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ABSTRACT

Increased participation and cooperation, for instance with citizens and civil society organisations, is a frequently mentioned goal in studies of public innovations. Such external relationships are seen to be an important factor in the development of public service innovation. In order to apply co-creation successfully, it is particularly important to investigate when and how the involvement of users contributes to the success of public sector innovations. However, the sparseness of outcome oriented empirical studies of co-creation in the context of public service innovations has been pointed out by several researchers.

Through the application of mainly quantitative data from a large-scale survey conducted in public administrations in six European countries and a pilot survey conducted among NGOs in six European countries, the thesis supplements empirical research in the field, which has been dominated by case studies. The findings of the thesis illustrate the value of a configurational approach for understanding co-creation in public service innovation contexts, as it shows how different user involvement methods combine with other input factors to form working pathways (configurations) to new and improved public services. The findings enhance our understanding of the conditions under which co-creation occurs and leads to successful public service innovation.

The thesis thereby contributes to a better, empirically founded understanding of co-creation in the context of public service innovation. The thesis focuses in particular on the prevalence of co-creation in public service innovation as well as the effects of different context-dependent configurations (combinations of conditions) on service innovation outcomes, and on the participation of NGOs in co-creation activities with government. This empirical evidence base is important in order to implement co-creation successfully. The thesis also contributes to the understanding of co-creation as a concept by applying operational measures of co-creation methods. The knowledge of the suitability of different user involvement methods in different contexts created by this project can be used by policymakers and public sector managers to choose appropriate co-creation strategies for their service innovation contexts. Insights about the conditions under which co-creation positively impacts service innovation outcome also contributes to further developing co-creation- and service innovation theory.

SAMMENDRAG

Økt deltakelse og samarbeid, for eksempel med innbyggere og sivilsamfunnsorganisasjoner, er et hyppig nevnt mål i studier av offentlige innovasjoner. Slike eksterne relasjoner anses å være en viktig faktor i utviklingen av innovasjon i offentlige tjenester. For å lykkes med samskaping er det spesielt viktig å undersøke når og hvordan involvering av brukere bidrar til å lykkes med innovasjon i offentlig sektor. Imidlertid finnes det få resultat orienterte empiriske studier om samskaping i sammenheng med offentlige tjenesteinnovasjoner, noe som er blitt påpekt av flere forskere.

Gjennom anvendelse av i hovedsak kvantitative data fra en større undersøkelse gjennomført i offentlig forvaltning i seks europeiske land og en pilotundersøkelse gjennomført blant frivillige organisasjoner i seks europeiske land, supplerer avhandlingen empirisk forskning på feltet som har vært dominert av case-studier. Funnene i avhandlingen illustrerer verdien av en konfigurasjonell tilnærming for å forstå samskaping i offentlige tjenesteinnovasjonskontekster, da den viser hvordan ulike metoder for brukermedvirkning kombineres med andre innsatsfaktorer for å danne strategier (konfigurasjoner) til nye og forbedrede offentlige tjenester. Funnene øker vår forståelse av under hvilke forhold samskaping skjer og fører til vellykkede offentlige tjenesteinnovasjoner.

Avhandlingen bidrar dermed til en bedre, empirisk fundert forståelse av samskaping i sammenheng med offentlig tjenesteinnovasjon. Konkret fokuserer avhandlingen på utbredelsen av samskaping i offentlig tjenesteinnovasjon, samt effektene av ulike kontekstavhengige konfigurasjoner (kombinasjoner av betingelser) på tjenesteinnovasjonsresultater, og på deltakelse av frivillige organisasjoner i samskapingsaktiviteter med myndighetene. Et slikt empirisk kunnskapsgrunnlag er viktig for å kunne gjennomføre samskaping på en vellykket måte. Oppgaven bidrar også til forståelsen av samskaping som begrep ved å anvende operasjonelle måleindikatorer basert på ulike samskapingsmetoder. Kunnskapen om ulike metoder for brukermedvirkning i ulike kontekster skapt i dette prosjektet kan brukes av beslutningstakere og ledere i offentlig sektor til å velge hensiktsmessige samskapingsstrategier for sine tjenesteinnovasjonskontekster. Den skapte innsikten om under hvilke betingelser samskaping påvirker tjenesteinnovasjonsresultatet positivt, bidrar også til å videreutvikle teori om samskaping og tjenesteinnovasjon.

PREFACE

The idea for this PhD-project came into existence as a result of the Co-VAL research project, "Understanding value of co-creation in public services for transforming European public administration (Co-VAL)", which was conducted as part of the Horizon 2020 project. Even though I my self was never part of the Co-VAL project, I have benefited a lot from the rich empirical data that was collected during that project and from the personal experience of my supervisor, Anne Jørgensen Nordli, who herself was engaged in the design of the Co-VAL surveys and the collection of the data. The collected data is unique because it is the first attempt to gather representative data on the co-creation of public innovation from six European countries, including different policy fields, types of innovation and levels of administration. The survey was specifically designed to measure the impact of different user involvement methods on the outcome of public innovation. The main purpose of this PhD-project was to make use of this unique material and to examine it with particular focus on the Norwegian data.

As to my personal motivation for engaging in this research project, prior to my engagement at the Inland Norway University of Applied Sciences in 2020, I served as a public employee at the regional county municipality for more than 10 years. During this period, I experienced a growing emphasis on user-centred service design and development. In recent years, co-creation had become a buzzword in public service design, often emphasised in guidelines and toolkits for public innovation introduced by central authorities. Slowly and at first far from steadily, we gained our first experiences with inviting service users into innovation processes through co-creative workshops or in-depth interviews as well as pilot testing. Although the experience was positive and exciting, co-creation with users was still far from being an integrated part of service development processes in my organisation and I wondered how this might be achieved. I was therefore interested to learn more about the concept, and to study the co-creation of public service innovation academically. I am grateful to the INSEPP PhD program for giving me that opportunity.

My work on this PhD project has in fact given me new insights as to why, in some contexts, co-creation with service users of public service innovation can be difficult to achieve or, in other words, why it can be challenging to implement co-creation as the essential principle of public innovation. I have come to understand that it is important to consider the context in

which new principles or ideas are introduced and to acknowledge possible inherent dilemmas and conflicts. Innovation and co-creation are both concepts that can be in conflict with the traditional principles of public bureaucracy, such as rule following, impersonality and standard procedures. Simply introducing them as magical solutions to public sector reform without addressing inherent conflicts with the logic of the public sector is not likely to lead to positive results. It is therefore important to study when and under which circumstances co-creation is a useful approach to public sector innovation. I hope that this thesis contributes to that discussion.

The PhD journey has been a very positive experience for me. I enjoyed my time at INSEPP a lot and I was very fortunate to meet many resourceful and inspiring people. The person that meant the most to me during that time was my supervisor, Associate Professor Anne Jørgensen Nordli. Without her, I could not have done it. Anne is an outstanding supervisor for many reasons. She is both brilliant and shares her knowledge generously. At the same time, she gave me the freedom to figure out things by myself and at my own pace, while always displaying confidence in me. This had an enabling effect on me, which I believe was very important to my progress. In addition, working with Anne is a lot of fun. When we were collaborating on writing a paper, it felt as though we were colleagues, rather than supervisor and student. I will miss her a lot and hope that we can work together again in the future. I would also like to thank the other members of my supervisor team: Associate Professor Maria Røhnebæk, Professor Martin Rønningen and Professor Gudbrand Lien, who all inspired and helped me with well-targeted, constructive feedback and comments. A special thanks goes to Professor Annette Risberg for her writing seminar, from which I learned a lot, and to Professor Rolf Rønning and my PhD-colleague Ingrid Hjertaker, who took the time to read my full thesis and give valuable feedback, as well as to Associate Professor Markus Grillitsch, who commented on the method section.

Moelv, 28.6.2023

Stefanie Gesierich

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2) Gesierich, S. (2023): Investigating Effects of Co-creation on Outcomes of Public Service Innovation – A Comparative Analysis at the National and Local Government Level in Norway. *Scandinavian Journal of Public Administration*, *27*(2), 22–38. https://doi.org/10.58235/sjpa.v27i2.10966

3) Gesierich, S. (2023): Approaches to co-creating successful public service innovations with citizens: A comparison of different governance traditions. Public Money & Management, 1-10. https://doi.org/10.1080/09540962.2023.2174448

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1. INTRODUCTION

1.1 The innovation imperative

The public sector has been under pressure to innovate as a response to challenging societal and environmental changes such as climate change, migration and an ageing population, whilst facing limited resources as well as paradigm shifts in governance regimes (Brandsen, Steen, & Verschuere, 2018; Hartley, 2013; Røiseland & Vabo, 2016). It is part of the "innovation imperative" (Thøgersen & Waldorff, 2022) to embrace the idea that innovation can contribute positively to the quality of public services, as well as the sectors' ability to adapt to societal changes and the efficiency of public service provision. According to the OECD (2015), public sector organisations need to be able to innovate, "constantly and reliably", so that innovative responses to any challenge can be deployed when and where needed. Over the past two decades, the public sector has faced increasing pressure to do more with less, due to global financial and economic crises, as well as the recent global pandemic, which has made the need for innovation even more urgent (Ansell, Sørensen, & Torfing, 2021; OECD, 2015).

While emphasising the need for public sector innovation, there has been a widespread understanding that the public sector has limited incentives to work on improving the quality and effectiveness of public services, due to a lack of user feedback mechanisms, as well as competition (Bloch, 2011). This points to the need for research on how public organisations can implement user feedback in their efforts to transform public services. Involving service users and civil society organisations in the creation of public services is assumed to lead to innovation and better outcomes of innovation (Bason, 2018). A user-oriented and efficient public sector is also communicated by the Norwegian government to be crucial to maintaining citizens' trust in it (KMD, 2020), which highlights the need for knowledge in the area.

1.2 User-orientation and co-creation: the new paradigm in public service innovation

Even though in recent years user-orientation has been articulated as a way to achieve public service innovation (Osborne, Radnor, & Strokosch, 2016) we still have very little empirical data on the use of co-creation practices and the effect of co-creation on innovation outcomes in the public sector (Voorberg, Bekkers, & Tummers, 2015). Very few studies have put the assumption of positive effects of co-creation on innovation to the test and there is a general lack of quantitative studies (Benoît Desmarchelier, 2019; Krogh, Sørensen, & Torfing, 2020). We do not know whether co-creation is associated with better or different outcomes compared to innovations that were developed without the use of co-creation (Torfing, Sørensen, & Røiseland, 2019; Verleye, 2015). Innovation is associated with uncertainties and risk and not all innovation projects succeed (Torfing, Cristofoli, Gloor, Meijer, & Trivellato, 2020). It is therefore essential to study which conditions and combinations of conditions contribute most to the success of public sector innovation projects. In this thesis, I am particularly interested in examining whether the inclusion of service users leads to more successful service innovation, which methods of user involvement are particularly successful, and which other conditions are important in combination with different user involvement methods. In addition, the thesis also investigates the degree to which non-governmental organisations might substitute direct user involvement by acting as co-creating partners in public service innovation projects. Including individual service users can be challenging for several reasons (Røiseland, 2016, 2023; Torfing et al., 2019). An increased focus on how civil society organisations can represent the user perspective has thus grown forward in the literature and co-creation (Ibsen, 2021).

Despite some achievements in the form of case-studies, more empirical research is needed of the conditions under which NGOs participate in public service innovation projects. More empirical evidence is also needed on the effects of different factors on innovation outcomes. Torfing et al. 2020 point especially to the need for comparative studies in order to strengthen the empirical evidence. It is therefore an interesting research opportunity to conduct comparative empirical studies on co-creation in public sector innovation projects and to evaluate whether successful public service innovation follows different pathways or configurations, depending on different contexts (Chen, Walker, & Sawhney, 2019). Furthermore, the literature on co-creation in public services is characterised by a lack of

conceptual clarification. There is no common agreement among scholars on one definition of co-creation and on the difference between co-creation and other concepts of stakeholder involvement, such as user involvement and collaborative innovation (Jukić, Pevcin, Benčina, Decman, & Vrbek, 2019; Aastvedt & Higdem, 2022).

1.3 Research aim and background

This thesis responds to the call for comparative empirical studies and contributes to the conceptualisation and analysis of co-creation in different contexts of public service innovation. The thesis aims to contribute to a better understanding of co-creation as a concept, and to a better empirically founded understanding of the conditions under which co-creation occurs and positively impacts public service innovation outcomes. The thesis does this by focusing on how co-creation can be operationalised and measured, by investigating the prevalence of co-creation in public service innovation, as well as the conditions under which co-creation occurs and leads to positive outcomes of service innovation, and the likely influence of different public innovation contexts on the co-creation of public service innovation.

As researchers have pointed out, such evidence base is necessary to implement co-creation as an integrated part of public service innovation. The knowledge of innovation and co-creation for innovation created by this project can be used by policymakers and public sector managers to choose appropriate co-creation strategies for their service innovations contexts. The adoption of co-creation practices in service innovation is resource-consuming in terms of both dedicated time and effort, and also in terms of monetary resources (Torfing et al., 2019). It is therefore important to gain a realistic image of the results and effects of co-creation on innovation by extending our knowledge of whether, when and how co-creation methods are most effective. On the basis of this research, pathways to successful user involvement in public innovation and specific innovation outcomes of public innovations can be developed.

The idea and data source for this thesis originated from the Co-VAL project (https://www.Co-VAL.eu/) and is linked to work package 2 (WP2) in this project. WP2 aims to measure and monitor innovation in the public sector and focuses on collecting and analysing data on co-creation during the development of an innovation, to evaluate the effect of the use of co-creation methods during the innovation process on the success of the innovation. It includes a large-scale survey of public administration managers responsible for innovation projects and a

smaller survey of managers of NGOs involved in co-creation roles in public sector innovation. The surveys were conducted in six countries (France, Hungary, the Netherlands, Norway, Spain and the UK) and focus on the use of collaboration and co-creation in innovative projects in order to produce policy-relevant metrics of co-creation activities. The thesis focuses on public service innovation because public services often include direct interaction with the service user and are therefore particularly relevant to the study of co-creation. Service innovation is defined as a new or improved service that differs significantly from the unit's previous service and that has been made available to potential users (OECD/Eurostat, 2018). The unit in this context is defined as the innovative organisation. In the survey of public administration managers, the units are national ministries and local municipalities. In the survey of NGO managers, the unit is the non-governmental organisation.

1.4 Structure of the thesis

Following this introduction, the second chapter of the thesis provides the theoretical background for public service innovation research and the concept of co-creation within that context. The chapter addresses the rationale, the concept and the existing knowledge about use and outcome effects, as well as the importance of context, followed by identification of relevant research issues. In chapter 3, these research issues are subsequently formulated as research questions, which steer the remainder of the thesis. Chapter 4 presents the methodology, including research philosophy, method, and research design, as well as information about survey design, data collection and the operationalisation of conditions and outcomes, followed by a description of the appended papers in chapter 5. Finally, chapters 6, 7 and 8 discuss the findings, their relevance, and the empirical, practical and conceptual contributions of the thesis, as well as limitations to this research and suggestions for future research agendas.

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2. THEORETICAL BACKGROUND

This chapter provides the theoretical background of the thesis. In the first part of the chapter, I give a short introduction into the development and relevance of public service innovation research including the identification of areas where more research is needed. In the second part of the chapter, I focus on collaborative innovation and co-creation within public service innovation research. The chapter provides an introduction into the argument in support of collaborative innovation and co-creation as well as its criticism, followed by an overview of the research fields that have influenced the development of co-creation as a concept and the existing conceptual diversity. The chapter also includes the initial definition of co-creation that served as a starting point for the work on this project. Furthermore, the chapter gives an overview of research on the use and effect of co-creation in public innovation including related challenges, as well as research into the importance of context regarding co-creation in public service innovation. The chapter ends with a summary of remaining research issues.

2.1 Public service innovation research

For many decades, research of public innovation has been living in the shadow of private sector innovation research (Hartley, 2013; Osborne & Brown, 2013; Windrum & Koch, 2008). Research of market-based innovation goes back for more than a century and much of innovation theory is derived from new product development in the manufacturing industry. Innovation studies have typically emphasised market competition and entrepreneurial initiative as the main driver of innovation. This goes back to Schumpeter (1912) and his theory of economic development, which has had a major influence on the development of innovation research. Due to this background, public sector innovation has often been considered an oxymoron, as the public sector lacks feed-back and competition mechanisms and because centralised control and reliance on rule-following tend to discourage innovation (Fitjar, 2015). For that reason, there has been far less focus on public sector innovation compared to marked based innovation. The lack of market mechanisms in the public sector has led to the assumption that public organisations must have inferior capacities when it

comes to innovating (Rønning, Hartley, Fuglsang, & Geuijen, 2022, p. 75). The understanding of the public sector as being disadvantaged in terms of innovation capability has led researchers and politicians to think that in order to become more innovative, public organisations have to become more like private organisations.

However, the emergence of service innovation research as a distinct branch in innovation studies has stirred interest in public innovation because the public sector is a large service provider (Djellal, Gallouj, & Miles, 2013; Miles, 2016). Service innovation research has emerged as a distinct research field in innovation studies based on empirical research that has revealed important differences compared to product and technological innovation (Miles, 2016; Tether, 2005). Given that many public innovations have service elements, the development of service innovation research has been important for the conceptualisation of public innovation (Rønning et al., 2022) and for the conceptualisation of collaborative innovation and co-creation. Many service innovations are embedded in the interaction between the service user and the service provider (Toivonen & Tuominen, 2009) and occur, for instance, in response to user needs, which makes co-creation a suitable approach to service innovation development.

There are similarities across sectors (public, private, and voluntary), especially in terms of service innovation, but also differences that have to be acknowledged. Public innovation research has developed into an established research field beyond the generalisation from marked based innovation to public sector contexts (Rønning et al., 2022, p. 1) and the distinctiveness of the public context is being recognised (Hartley, 2013). A key difference between the public and private sectors lies in the governance of control and decision-making, which is considerably more heterogeneous in the public sector than in the business sector. Innovation processes in the public sector must be carried out in a way that does not conflict with the democratic principles that underpin the activities in the public sector (Fitjar, 2015). However, politicians may have difficulties understanding the day-to-day challenges of public services because they have limited knowledge and experience concerning what happens in the field. Therefore, managers and employees have an important role in considering the opportunities for change and innovation through their contact with public service users and civil organisations that represent user needs. Public sector innovation is thus likely to co-evolve between the microlevel of the public service agency and the level of public governance in a multi-actor framework (Fuglsang & Rønning, 2014). This implies that innovation policies

and governance frameworks are likely to influence the occurrence and mode of public innovation (Djellal et al., 2013).

In summary, innovation in the public sector, and particularly public service innovation research, has been acknowledged as an established field of study that draws on literature from marked based service innovation, as well as literature from public administration research (Chen et al., 2019; Osborne & Brown, 2013). However, empirically it has not yet received the same attention as private sector innovation. Researchers point especially to the need for more knowledge about the circumstances in which public innovation fails or flourishes. For instance, De Vries et al. (2016) suggest that future research on innovation in the public sector should employ multi-method studies that cross countries or sectors in order to be able to analyse the effects of various inputs and combinations of inputs on innovation in the public sector. Following this research call, the thesis contributes to the knowledge base of public sector innovation by empirically investigating the interplay of the conditions under which co-creation occurs and positively affects public service innovation outcomes, with particular focus on co-creation with service users and non-governmental organisations.

2.2 Collaborative innovation and co-creation in public service innovation

Increased participation and cooperation, for instance with citizens and the voluntary sector, is a frequently mentioned goal in studies of public innovation (De Vries, Bekkers, & Tummers, 2016). Such external relationships are seen to be an important factor in the development of public innovation (Chen et al., 2019; Torfing & Ansell, 2017; Torfing, Cristofoli, et al., 2020). The focus on collaborative innovation and co-creation is often linked to the need to resolve increasingly complex problems and rising expectations among citizens, in combination with increasingly limited public resources (Chen et al., 2019; Røiseland & Vabo, 2016). In addition, scholars have observed the shifting paradigms of governance and public management from traditional public administration to New Public Management (NPM), and recently to New Public Governance (NPG), which, in turn, requires new innovation strategies (Hartley, Sørensen, & Torfing, 2013). Osborne (2006) claims that NPG combines the strong sides of the traditional Public Administration (PA) approach and the market-oriented New Public Management (NPM) by acknowledging the legitimacy of both the policy making process and the service delivery. New Public Governance is aimed at encompassing the increasingly complex environment of public management by emphasising the collaboration of multi-actors across organisations and sectors as a necessary condition in public service innovation (Osborne, Radnor, & Nasi, 2013; Osborne et al., 2016). This

background of shifts in public governance paradigms paved the way for collaboration and co-creation with service users and other external stakeholders as central features in public service innovation (Ansell & Torfing, (Eds.) 2014; Hartley et al., 2013; Pollitt & Bouckaert, 2011; Torfing, 2019). That being said, public participation and collaboration is not a new phenomenon in public service provision and innovation. Particularly the Scandinavian countries have a long tradition of democratic participation in different forms (Røiseland, 2016, 2022; Røiseland & Lo, 2019). However, the rise of the new public governance paradigm adds a stronger normative emphasis on perceiving co-creation as the leading principle in public governance (Ansell & Torfing, 2021a, 2021b).

Collaborative innovation: the argument and its criticism

The advocates of collaborative innovation argue that collaborative strategies are superior to more traditional approaches such as hierarchical innovation strategies and market-based innovation strategies (Bommert, 2010; Sørensen & Torfing, 2011; Torfing, 2019). Neither the competition-based innovation theory within the NPM paradigm nor the top-down innovation approach based on the PA paradigm have been able to sufficiently explain how innovation in the public sector occurs. Collaborative innovation is thus a result of the perceived inadequacy of previous innovation theories (Bommert, 2010). Arguments in favour of collaborative innovation include the idea that multi-actor collaboration helps to produce a better understanding of the problem at hand and to create a greater variety of ideas, and also to stimulate mutual learning. This in turn leads to better solutions and makes it easier to implement and spread successful innovations (Ansell & Torfing, 2021b). Particular focus has been directed towards the involvement of service users as one of the primary stakeholders in service innovation (Jæger, 2013). Involving service users in the innovation process increases opportunities to create services that match the actual needs of the service user. This can also contribute to increasing the acceptance and distribution of the innovation (Trischler, Dietrich, & Rundle-Thiele, 2019). In public innovation, service users can be citizens, residents, organisations, or businesses.

However, there may be obstacles to involving individual users in public innovation such as difficulties in finding relevant and willing participants, or in situations where vulnerable service users are unable to participate due to illness or disabilities, for instance in the case of health and welfare services (Andreassen, 2008; Skarli, 2021). Agger and Lund (2017) argue that in large parts of the public sector, in health care for instance, the client role is still the dominating view of citizens. This perception of citizens as passive recipients who lack the

capacity to contribute could influence the role they are offered in public service innovation and may limit the use of co-creation as a mode of collaborative innovation. Co-creation may also lead to inequality problems due to some participants being more resourceful than others (Røiseland, 2023). In these situations, non-governmental organisations (NGOs) can play a role by substituting for individual user input through the representation of user needs or by helping to find relevant participants. NGOs are in a unique position to contribute to service innovation for residents through their experience with community activities and from giving citizens a voice, pioneering service innovation that addresses user needs that are neglected by markets or governments, and enhancing established public services (Pestoff & Brandsen, 2010). These experiences can give NGO staff a deep understanding of the problem that service innovation needs to address (Windrum, Schartinger, Rubalcaba, Gallouj, & Toivonen, 2016) which makes them a valuable partner for public organisations in the development of service innovation. NGOs can draw on their understanding of user experiences to transfer in-depth knowledge of user needs to innovation design teams (Andreassen, 2008; Greenspan, Cohen-Blankshtain, & Geva, 2022) or to provide ideas for public sector innovations (Merickova, Nemec, & Svidronova, 2015). There is, however, little empirical data about the involvement of NGOs in public innovation projects (Ibsen, 2021), which is why one of the objectives of this thesis is to contribute to our knowledge of NGO participation in public service innovation. In addition to the challenges of involving citizens as service users, another challenge of collaborative innovation is the orchestration of collaborative interactions between different actors (Torfing et al., 2019). The diversity and plurality of insights that might foster innovation could also lead to tensions and dissonance that undermine the intended benefits from such collaboration (Isaksen, 2020; Røhnebæk, 2021; Steen, Brandsen, & Verschuere, 2018; Wegrich, 2019).

Co-creation: the concept

Several literature studies have pointed out that co-creation theory is characterised by a lack of one common conceptualisation and clear definition of co-creation (Jukić et al., 2019; Voorberg et al., 2015; Aastvedt & Higdem, 2022). The source of this conceptual confusion can most likely be found in the number of different research fields that have influenced the development of co-creation research. As a result, several partly overlapping definitions and interchangeable terms do exist. It is, for instance, difficult to separate co-creation from related concepts such as collaborative innovation, user involvement or co-design. This presents a

challenge for the measurement of co-creation and the comparability of co-creation studies (Aastvedt & Higdem, 2022).

The co-creation concept finds its origins in the business management literature. Prahalad and Ramaswamy (2004) emphasised how consumers increasingly play an active role in creating and competing for value. As such, consumers are considered a new competence source for corporations. In other words, the idea is that involving end-users and other relevant stakeholders widens the knowledge base and brings new perspectives into the innovation process, which leads to better products and services and more efficient delivery (Ramaswamy & Gouillart, 2010, p. 71). Transferred to the public domain, co-creation implies a partnership between public organisations and public service users (Alves, 2013; Farr, 2013; Hilgers & Ihl, 2010; Langergaard, 2014). End-users of public services and other relevant stakeholders are thus considered partners of public organisations and governments in the co-creation of innovation which means that they are involved in the essential aspects of developing public services (Bason, 2018; Stephen P. Osborne et al., 2013).

Another field that has influenced co-creation research is the service management literature (Stephen L. Vargo & Lusch, 2008; Stephen L Vargo, Maglio, & Akaka, 2008) that contrasts the goods-dominant-logic (GDL) by which firms produce products, which are then consumed by customers, with a service-dominant-logic (SDL). In this logic, the perspective is that value comes from use. This implies that value is always co-created between the service user and the service provider and is determined by the service user through service use (Stephen L Vargo et al., 2008). The SDL has later been adapted to public services – the public-service-logic (PSL) (Osborne, 2018) – by integrating key issues of the public sector context, such as political mandate, power imbalances and unwilling service users, into the debate (Osborne, 2020, p. 42).

A third field that has influenced co-creation research is the field of design (Leavy, 2012; Sanders & Stappers, 2008; Stickdorn, Hormess, Lawrence, & Schneider, 2018). The idea of active user involvement through "participatory design" assumes that the creation of usable services, spaces or products will benefit from the involvement of the people who are to use them (Ind and Coates, 2013). Participatory design techniques and methods encourage users and other stakeholders to contribute their own experience and ideas by using a collaborative team approach that allows non-designers to become members of the design team (Sanders and Stappers, 2008; Trischler *et al.* 2019).

Public administration and management research has traditionally focused on public participation as a means to reduce power inequalities in society (see, for instance, Arnstein (1969) and Nabatchi (2010)). Unlike conventional forms of democratic participation such as citizen panels, town-hall meetings or public hearings, co-creation does not focus on inclusion and democratic representation (Ansell & Torfing, 2021; Lund, 2018). Instead, co-creation aims at integrating relevant knowledge and resources into the innovation process in order to achieve better innovation outcomes. In this context, service users would not participate as citizens with political rights, but as co-creators who contribute input to the identification of user needs, as well as the design and testing of new or improved services. Another line of public sector literature focuses on the co-production of public services through citizen input in the design and delivery of a service (Alford, 1998, 2009; Ostrom, 1990). The terms co-production and co-creation have thus often been used interchangeably (Voorberg et al., 2015) although several different conceptual ways of separating co-creation and co-production have been proposed. For instance, Voorberg, Bekkers and Tummers (2015) propose to assign the term co-creation to the initiation and design stage of an innovation and the term co-production to the implementation stage. Others emphasise that co-creation, in contrast to co-production, implies a creative element, linked to the development of something new: Co-creation refers to a collaborative process whereby service providers and service users actively engage in the creation of new services or the improvement of existing ones (Osborne et al., 2016; Torfing et al., 2019). Hence, co-creation is a more suitable term than co-production in the context of innovation. The concept of co-creation implies fostering innovative solutions by leveraging diverse knowledge, expertise and resources, which typically occurs in the early stages of service development, or when significant changes are made (Alves, 2013). Innovation is thus one of the key characteristics of co-creation. Co-production, on the other hand, focuses on the involvement of service users in the delivery or co-delivery of public services and typically occurs during the operational stage of service provision (Alford, 2009).

This thesis focuses on the context of innovation and therefore uses the term co-creation, rather than co-production. The definition of co-creation in the Co-VAL survey was based on Voorberg et al. (2017): "The involvement of citizens in the initiation and/or design of public services.", but since the survey covers different types of service users, it has been adapted to include other service users who are not citizens (such as residents or other public and civil organisations as well as private firms):

The involvement of service users in the initiation and/or design of public services.

This definition was the starting point for the operationalisation of co-creation in this thesis and has been further refined during its course. The thesis shows, for instance, how to differentiate co-creation from other types of user involvement methods by distinguishing between participatory user involvement, when users participate actively and directly, and user-oriented methods such as research of user behaviour or real-time studies using observational techniques. This operationalisation of co-creation was used in paper 2 and paper 4. In paper 3, user involvement methods were additionally assigned to different stages of the innovation process in the form of co-implementation and co-design. Further discussion of the operationalisation of co-creation follows in chapter 6.

Use and effect of co-creation in public innovation

There is reason to believe that co-creation has moved beyond the theoretical level (Bason, 2018; Voorberg et al., 2015). The Organisation for Economic Co-operation and Development (OECD) as well as many national governments have adopted policies and toolkits for user-oriented collaborative design of public services. For instance, the Norwegian national policy for public sector innovation (KMD, 2020) names user orientation and collaboration as two of the key principles for public innovation. However, given the predominance of case-based research in the field of co-creation, there are few studies that provide insights into where and to what degree co-creation practices have been adopted across different public sector policy fields. This is surprising in light of the attention that co-creation has received in recent years. We do not know whether co-creation is still an experimental, pioneering initiative, or whether it is applied on a large scale as the modus operandi in public service innovation. It is, for instance, thinkable that the most common involvement of users concerns less challenging low-level participation whereby knowledge flows in one direction from the citizen to the innovating entity. This would imply that co-design is relatively rare, with the involvement of users being greatest at the research and post-implementation stages (Arundel et al., 2018).

Research on co-creation and collaborative innovation is characterised by a normative optimism (Wegrich, 2019). The involvement of users is most often assumed to have a positive effect on innovation outcomes (Rønning et al., 2022; Steen et al., 2018) without that assumption being put to a test (Voorberg et al., 2015). There is, however, a growing body of research that points to potential obstacles to the success of co-creation, such as difficulties in motivating relevant and affected actors to participate, the transaction costs associated with prolonged interaction, communication problems between different

participants, and destructive conflicts that may prevent joint dialogue, learning and the fostering of agreement (see for instance (Engen, Fransson, Quist, & Skålén, 2021; Parker, Cluley, & Radnor, 2023; Steen et al., 2018)). Moreover, actors may be risk-averse in the implementation of disruptive innovation due to the absence of stable rules, a clear division of labour and hierarchical control (Torfing, 2016; Torfing, Cristofoli, et al., 2020). Collaborative service innovation typically involves operations that are in conflict with the characteristics of traditional public administration such as functionality division, hierarchy and management through command and control. There is thus a trade-off between vertical integration and specialisation of services on the one hand, and horizontal joined-up working and holistic management on the other hand (Quist & Fransson, 2014). Co-creation potentially challenges the traditional role perceptions of citizens, politicians and public officials (Torfing, Sørensen, & Røiseland, 2020) and the existing forms of democratic participation and decision-making in the public sector (Røiseland, 2023; Røiseland & Vabo, 2016; Torfing et al., 2019). Therefore, management support and support from politicians cannot be taken for granted. Some politicians might see their power diminished by the process of co-created policy making (Sønderskov, 2019), and public managers and employees might experience user input as a threat to their roles as professionals and experts (Bentzen, Sørensen, & Torfing, 2020; Jenhaug, 2020).

The aforementioned obstacles to co-creation point to the possibility of negative effects in public service innovation contexts. It is therefore important to investigate when and how the involvement of users contributes to the success of public sector innovation. However, the sparseness of outcome oriented empirical studies on co-creation in the context of public service innovations has been pointed out by several researchers (Torfing et al., 2019; Voorberg et al., 2015). More research is also needed on the conditions in which co-creation leads to successful innovation, such as the extent to which and how stakeholders are involved (Krogh et al., 2020; Torfing, Sørensen, et al., 2020; Voorberg et al., 2015). Although some important empirical research has been conducted regarding the participation of service users during service delivery, little is known about how novel approaches might enable value co-creation, such as contemporary service design and co-design methodologies (Rubalcaba, Strokosch, Hansen, Røhnebæk, & Liefooghe, 2022).

This thesis focuses on the service-related effects of public service innovation projects. More precisely, the outcome variable applied in paper 2 and paper 3 includes positive effects on four outcome categories from service innovation, namely: service quality, user experience of

the service, user access to information and the safety of citizens and residents. The outcomes are assessed on an aggregated level, representing public value in the form of better services. The application of co-creation in this thesis is thus linked to the creation of public service outcomes in the form of improved services. The Co-VAL survey, which serves as the data basis for this thesis, is the first survey to provide representative data on co-creation in the public sector that allows for comparative analyses between countries. Comparable representative data on the adoption of co-creation practices is necessary in order to gather information on and conduct analysis of the relevance of different antecedents and contexts for the use and effect of these practices.

The importance of context

It is highly questionable that successful paths to innovation and co-creation can be adopted and replicated independently of different contexts (Ansell & Torfing, 2021b, p. 29; Rønning et al., 2022, p. 114). In the public sector, a country's state and governance tradition would impact the relationship between citizens and public organisations (Voorberg et al., 2017). Co-creation is embedded in the concept of collaborative innovation that is linked to the theory of New Public Governance (NPG). NPG advocates human-centred collaborative decision-making processes which focuses on inter-organizational relationships and the governance of processes in a multi-actor framework (Ansell & Torfing, 2021; Osborne, 2006). The aim is to govern through networks which involve close collaboration with equal partners. Therefore, in NPG, citizens become 'co-creators' and are expected to deliver valuable input to the development of public services (Voorberg et al., 2017). These partnerships and horizontal relationships between citizens and governments are fundamentally different to older paradigms, such as New Public Management (NPM) and traditional Public Administration (PA) (Osborne, 2006). In traditional public administration, citizens are regarded as passive recipients of services with no contribution to make to their development. In the new public management paradigm, citizens are viewed as customers based on a quasi-market using competition. Likewise, the relationship between NGOs and governments is likely to be influenced by the dominant operational governance paradigm (Brock, 2020). In traditional public administration, the government is the main provider of public services, implemented through hierarchical top-down processes characterised by a strict division between politics and administration and a strong focus on rules and protocols to ensure just and equal treatment, as well as transparency (Brock, 2020; Merlin-Brogniart et al., 2022). Under these conditions, government retains control of the innovation process, with NGOs

playing a limited and supplementary role. Under the new public management paradigm, contracting out to the private and non-profit sectors is seen as a key ingredient in public service provision (Brock, 2020). NGOs are encouraged to develop and provide services for citizens and residents as competitors to public organisations with the aim to contain costs, strengthen civil society and improve efficiency (Smith & Smyth, 2010). The emphasis on collaboration and resource integration in the new public governance paradigm should foster a high degree of NGO-government co-creation activity in public service innovation in governance contexts that are dominated by this paradigm (Merlin-Brogniart et al., 2022).

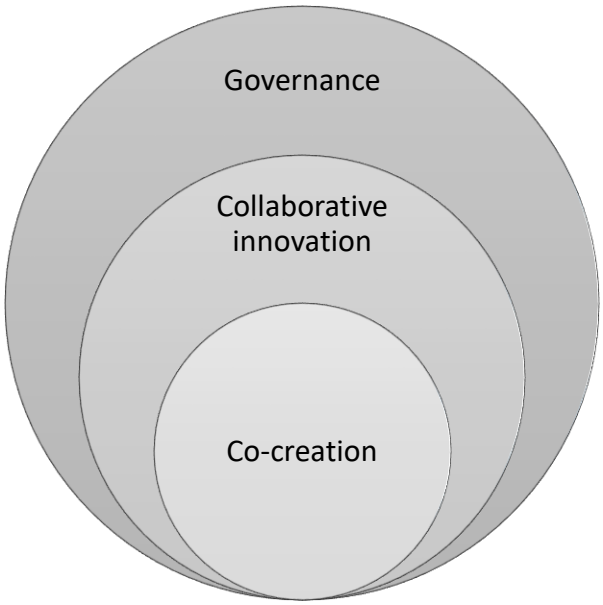
Following this line of reasoning, it should be possible to infer which public innovation strategies and governance paradigms are the most dominating, based on the extent to which service users and NGOs are involved in co-creation activities with public organisations. Table 1 illustrates the relationship between the governance paradigm, and the public innovation strategy, as well as the role of the citizen as service user and the role of NGOs in public innovation.

Table 1 Governance paradigms, innovation strategies and the role of the service user or NGO

Governance paradigm	Public innovation strategy	Role of the citizen as service user	NGO involvement in public innovation
Public administration	Hierarchical	Recipient	Limited/Supplementary
New public management	Market-based	Customer	Contractual
New public governance	Collaborative	Co-creator	Collaborative

The term governance refers to the mode of political steering, as the system in which political and administrative decisions are made that includes different modes of coordination, service production and innovation in the public sector (Merlin-Brogniart et al., 2022). Without a mode of governance that supports collaborative approaches in finding innovative solutions to challenges and problems that might occur, collaborative innovation and co-creation would be extremely difficult to achieve. Collaborative innovation refers to the mode of innovation that supports collaborative approaches, methods and techniques such as co-creation methods (Aastvedt & Higdem, 2022). Figure 1 illustrates the relationship between the mode of governance, the mode of innovation and co-creation. Co-creation is here seen as a form of collaborative innovation, and collaborative innovation is seen as a form of governance.

Figure 1 The relationship between governance, collaborative innovation and co-creation



It is likely that the way in which new governance paradigms and innovation strategies are adopted will depend on the existing state and governance traditions (Voorberg et al., 2017). However, there is limited empirical knowledge about the relationship between state and governance traditions and co-creation. The case study conducted by Voorberg et al. (2017) only contains four cases. Given the far more extensive data from the Co-VAL survey of six European countries, comparing countries with different governance traditions for their adoption of co-creation practices presents an interesting research opportunity.

In addition to the prevailing public governance regime and the existing tradition of governance and political culture, organisational antecedents such as management support of risk-taking and innovation are also likely to influence the adoption and success of new practices such as co-creation (Ansell & Torfing, 2021b). Furthermore, there is reason to assume that configurations for successful service innovation might differ by level of administration (national or local). Co-creation is assumed to be more prevalent at the local government level compared to the national level because of a greater proximity between service users and public agencies (Ansell & Torfing, 2021a; Ansell & Torfing, (Eds.) 2014). In addition, local municipalities are often subject to particular pressure from a combination of rising expectations of service delivery and scarce resources, for instance in the field of health and welfare services. It could thus be assumed that local municipalities have to turn to external stakeholders, for instance service users and civil society organisations, as

contributors and additional resources in service innovation processes, in order to supplement internal resources or substitute the lack thereof. On the other hand, the orchestration of collaborative activities that include multiple actors might be time and resource consuming, which could be a greater impediment for local municipalities that are presumably smaller in size and have fewer resources than national public organisations (Torfing et al., 2019).

Co-creation is often applied as part of a design-thinking framework and in recent years such frameworks have gained increased attention in public innovation contexts (Lewis, McGann, & Blomkamp, 2020; McGann, Blomkamp, & Lewis, 2018). Using design thinking in service innovation involves the systematic application of design methodology and principles to public services, with the goal of designing those services from the perspective of the user (Bason & Austin, 2021). The most important elements in the process include conducting research to identify challenges, conducting research to identify different types of users, brainstorming or idea generation to identify solutions, developing a prototype and pilot testing (Tschimmel, 2012). Each stage of the design process may involve co-creation with users; however, user centredness can also be addressed through observational ethnographic studies or surveys. In other words, co-creation methods may also be used without applying the full design thinking framework and not all elements of a design thinking framework include co-creation. Design thinking should be understood as a framework for innovation which involves the use of different design techniques and methods that often will, but do not necessarily have to, involve co-creation with users and stakeholders (Stickdorn et al., 2018). However, the systematic use of design thinking frameworks in public innovation is not widespread (Lewis et al., 2020), and our understanding of whether incorporating co-creation within a design thinking approach yields different innovation outcomes compared to using co-creation methods alone is limited.

2.3 Summary of remaining research issues

The literature review reveals several unresolved research issues. Firstly, the conceptual diversity in the field of co-creation makes the concept difficult to measure and reduces the comparability of co-creation studies. This has probably contributed to a lack of empirical data in the form of quantitative studies. Secondly, although policies and toolkits have been implemented to facilitate collaborative user-oriented design of public services, there is a lack of understanding regarding the extent of co-creation practices adopted in public sector service innovation. Thirdly, research in this area tends to have a normative bias towards the optimistic view that user involvement leads to positive innovation outcomes, despite the absence of

empirical evidence and several potential obstacles to the success of co-creation. Finally, successful pathways to co-creation will likely vary between different contexts of public service innovation but due to the lack of comparable co-creation studies from different contexts there is little empirical evidence to support this.

Overall, there is a considerable amount of theory regarding the positive effects of co-creation, but little empirical research that allows for generalisation, and little knowledge about how different user involvement methods should be combined, depending on the context. More research is necessary to comprehend the conditions under which co-creation leads to successful innovation in different contexts. In general, there is a need for more empirical research on the involvement of individual service users and NGOs in collaborative public innovation. This requires the development of co-creation indicators and an operational definition of co-creation that can be applied to the measurement of co-creation in innovation.

3

3. RESEARCH QUESTIONS

This chapter presents the main research areas and research questions of this thesis that are derived from the analysis of the remaining research issues in the previous chapter. In the previous chapter, we established that, even though the body of research on co-creation in public service innovation has grown substantially in recent years, there are still some areas where more research is needed. The reviewed literature points especially to two main areas of research that require more attention:

1. Understanding and operationalising the concept of co-creation in public service innovation, and
2. Understanding the conditions under which co-creation occurs and positively affects public service innovation outcomes.

The complexity and diversity of the conceptual understandings of co-creation and the lack of a clear operational definition are barriers to successfully assessing, evaluating and monitoring co-creation efforts across different public service organisations. This in turn can limit our ability to apply co-creation successfully. The thesis thus aims to develop a conceptual understanding and operational definition of co-creation relevant to the context at hand. The first research question therefore asks:

RQ1: How can co-creation be operationalised and measured in different public service innovation contexts?

Knowledge of the prevalence of co-creation in public service innovation and the conditions in which the use of co-creation methods has a positive effect on the outcomes of innovation is necessary in order to build an evidence base for the use of co-creation in public innovation. This thesis emphasises the importance of configurations of conditions to explain their effect on service innovation outcomes and argues that this approach adds new insights to the current research on co-creation that expand our understanding of how successful public service innovation emerges. Therefore, the second and third research questions ask:

RQ2: What is the prevalence of co-creation in public service innovation?

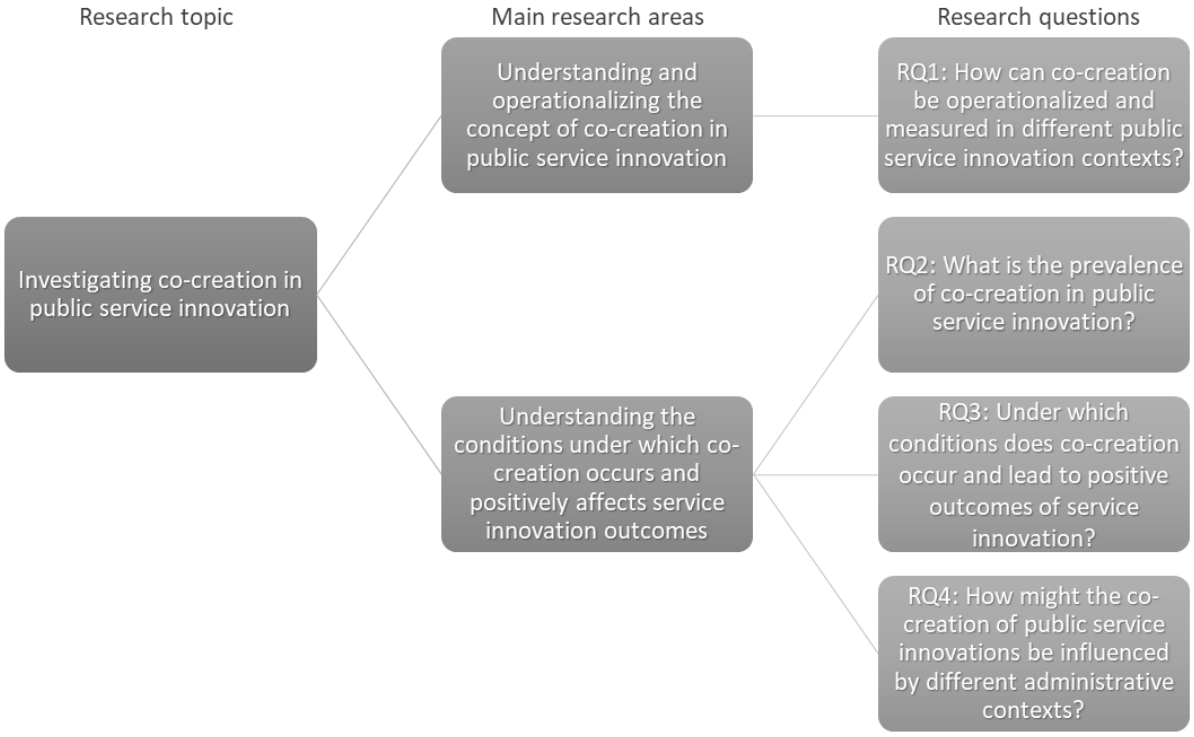
RQ3: Under which conditions does co-creation occur and lead to positive outcomes of service innovation?

Furthermore, there is reason to assume that different contexts of public administration might require different configurations of conditions. Thus, the fourth research question is:

RQ4: How might the co-creation of public service innovation be influenced by different administrative contexts?

Figure 2 illustrates the connection between the overall research topic, the main research areas on which the thesis focuses and the four corresponding research questions.

Figure 2 Research topic, main research areas and research questions



RQ1 contributes to the identification of key-co-creation elements and the development of co-creation indicators that can be used in innovation surveys as well as to the development of an operational definition of co-creation that can be used in the context of public service innovation. RQ2 and RQ3, respectively, aim at improving our empirical knowledge of the use and relevance of co-creation in public service innovation, as well as our knowledge of the effect of co-creation on positive service innovation outcomes. RQ4 contributes to the understanding of how the use and effect of different co-creation methods and strategies might vary, depending on the context.

4

4. METHODOLOGY

This chapter presents the philosophical foundation that guides the approach to conducting research in this thesis, followed by an introduction of the analytical method including a description of the research process. The chapter proceeds by presenting the survey and the collected data. Finally, the chapter includes an overview of the operationalisation and calibration of the outcomes and conditions that were applied in the analyses in this thesis.

4.1 Research philosophy

The common metaphysical approach to scientific research is the belief that the method of enquiry is predetermined by assumptions concerning the nature of reality and the nature of knowledge (Moses & Knutsen, 2019). The two are connected through questions about the possibility of "truth" in the form of "objective knowledge" about that reality (Morgan, 2007). Assumptions about the nature of reality are fundamental to assumptions about the nature of knowledge. These assumptions, in turn, limit the range of methodological assumptions about generating knowledge (Guba & Lincoln, 1994).

However, this thesis is inspired by an alternative approach anchored in the philosophy of Pragmatism that does not view knowledge as an abstract relationship between the knower and the known. Instead, producing knowledge is about an iterative process of enquiry that creates an ongoing back-and-forth movement between theory and empirical observation (Morgan, 2014). Hence, the most important aspect in discovering truth about reality is the investigative process (Dewey, 2013; Peirce, 1955). Pragmatism recognises that there are numerous ways of interpreting the world and that achieving the bigger picture will require different points of view. Instead of aiming at the discovery of an overarching, ahistorical, universal structure, scientific enquiry as a search for knowledge is the means of developing and replacing beliefs about nature and society (Mladenović, 2017). In other words, even though we might never find The Truth, or at least we will not be able to know whether we have found it or not, the conversation is worth continuing (Rorty, 1980).

This, in turn, suggests that a scientist should apply whatever method fits the research question best, as long as it contributes to the ongoing scientific enquiry (Feyerabend, 1978; James, 1907). Different ways of knowing lead to better knowledge of the research object. Hence, multiple argumentation (different types of evidence, data and arguments used to support a scientific hypothesis or theory) makes a stronger case than any of these types of arguments would make by themselves. Combining quantitative and qualitative methods is therefore not only epistemologically coherent, but also desirable (Howe, 1988). However, Pragmatism should not be understood as a mixed methodology. On the contrary, Pragmatism as research philosophy rejects any automated choice of method (Morgan, 2014).

Furthermore, assumptions about reality are not indisputable and can change during research. Strict adherence to methodological rules thus implies a dogmatisation of the underlying assumptions. This could hinder research, or even bring it to stagnation (Rorty, 1981). Pragmatism recognises therefore, that method is secondary to the research question itself. When considering a research design, we should always start with the research questions and then carefully consider the appropriate theoretical frameworks and methodologies that will best support the aim of the research project, before selecting the methods and techniques for gathering data (Tashakkori & Teddlie, 1998). The value that Pragmatism places on continuous enquiry makes it particularly suitable as a research philosophy for the social sciences (Ansell, 2011; Morgan, 2014).

In the spirit of Pragmatism, this thesis does not aim at developing a universal theory of co-creation. Instead, this thesis contributes to the ongoing discussion of co-creation in public service innovation by adding pieces to the puzzle, which contributes to enhancing our view of the bigger picture. The empirical findings presented in this thesis can be interpreted as "warranted assertibility" (Dewey, 1941), propositions gained through the ongoing, self-correcting process of enquiry, which through the integration of knowledge can contribute to a process of evolutionary learning (Ansell, 2011). The research questions and the research design in this thesis are formulated in a way that acknowledges the interrelationship between the subject of interest and its context. The research process was conducted as an exploratory back-and-forth movement between theory and empirical findings which in spirit comes close to the pragmatist method of enquiry introduced by Charles Sanders Peirce (1955), called abduction, that builds theory based on patterns in empirical observations.

4.2 Method and research design

Why Qualitative Comparative Analysis?

This thesis applies a configurational approach that recognises the interdependent nature of the conditions that influence the use and effect of co-creation practices in public service innovation. The configurational approach helps integrate different aspects of service innovation processes and gives a more nuanced picture of how co-creation in public service innovation occurs and positively affects service innovation outcomes. Thus, the main method applied in this thesis is fuzzy set Qualitative Comparative Analysis (QCA).

QCA attempts to bridge the inherent trade-off between the depth of in-case-explanation (internal validity) and the empirical breadth of the cases (external validity) by combining the assessment of within-case complexity with systematic cross-case comparison (Ragin, 2014; Thomann & Maggetti, 2020). Through the combination of contextual interpretation with the systematicity and robustness of larger-N comparative analysis, QCA goes beyond the classical quantitative-qualitative divide and therefore fits the pragmatist approach to scientific enquiry (Velástegui, 2016).

QCA is suitable when several different factors appearing together cause a certain result. This means that variations in each and every one of these factors can change the result and that all combinations of factors (specific levels of these) and their results must be analysed (Longest & Vaisey, 2008). This makes the method particularly suitable for answering the research questions in this thesis because co-creation and innovation in the public sector are complex phenomena that are not likely to be caused by isolated conditions (Torfing, Cristofoli, et al., 2020; Torugsa & Arundel, 2016, 2017).

Besides the assessment of complex causality, a more practical reason to work with QCA is that the method can be used for small and intermediate samples or populations (10- 100 cases), like the samples used in the empirical analyses included in the appended papers, but it can also be used for larger groups. Ideally, the number of cases is between 10 and 100. In addition, fuzzy set QCA allows for capturing variations in the degree in which a certain

phenomenon appears. The fuzziness does not derive from imprecise empirical information, but from non-sharp conceptual boundaries (Schneider & Wagemann, 2012).

The concept of complex causality

The complex causality on which QCA focuses has several characteristics. First, QCA investigates how conditions work together as a causal recipe in causing an outcome. This is called *conjunctional causation*. Another aspect of complex causality is *equifinality*, which means that more than one condition or combination of conditions (configurations) might lead to the same outcome. Further, QCA identifies whether and how a condition works differently in different cases. In one case, the presence of a condition might lead to an outcome and in another case, the absence of that condition might lead to that outcome. QCA thus allows for a context-specific analysis of causation. Lastly, QCA assesses *asymmetric causation*. Asymmetry means that the configuration for the occurrence of the outcome is not simply the opposite of the configuration for the non-occurrence of the outcome. Therefore, the explanation of the non-occurrence of the outcome cannot be derived from the explanation of the occurrence of the outcome and needs to be assessed separately. In the context of this thesis, asymmetric causation implies that we cannot draw conclusions about configurations that lead to a low level of positive effects or negative effects, based on the configurations that lead to a high level of positive effects on innovation outcomes.

QCA enables the analysis of complex causality due to its set-theoretic approach. Sets are groups of cases that are similar in either the outcome or with one of the conditions of interest. By analysing how sets relate to each other and by theorising the causal significance of their relation, it becomes possible to investigate complex causality. In QCA, causal relationships are expressed as sufficient and necessary conditions (Rihoux & Ragin, 2008). A condition is considered sufficient for the outcome if every time the condition is present, the outcome occurs as well, but at the same time the outcome could also occur from other conditions. A condition is necessary for an outcome if it is present every time the outcome occurs. In other words, the outcome cannot happen without that particular condition (Schneider & Wagemann, 2012). However, during the analyses in connection with this thesis, no necessary conditions were found, which supports the argument that the success of public service innovation cannot be predicted by the presence of single factors.

I have used qualitative comparative analysis to compare results within different parts of the public sector in order to answer three of the research questions (2, 3 and 4). RQ 2 and 3 focus

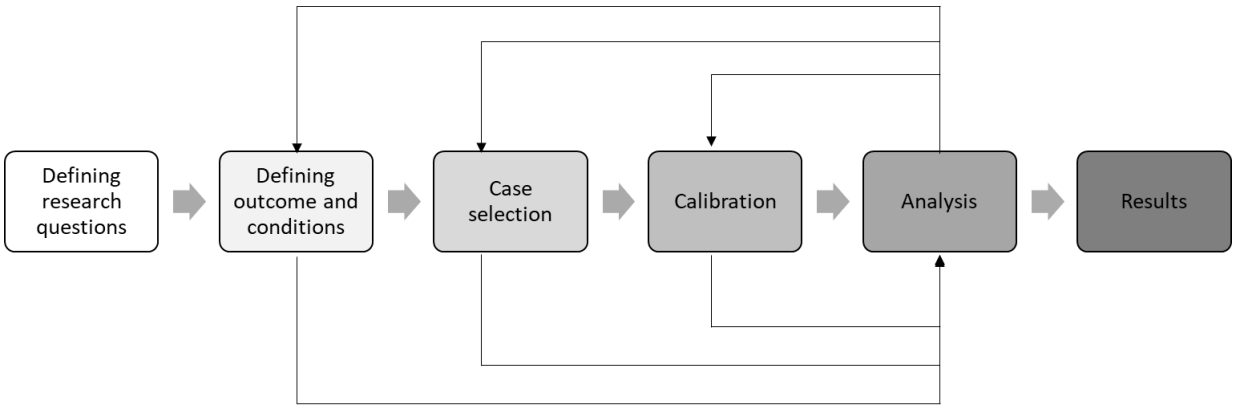
on finding empirical evidence of the causal relationship between co-creation (in different forms and degrees), and high levels of positive effects on service innovation outcomes, by identifying which configurations of co-creation methods and other related conditions lead to high levels of positive service innovation outcome. Paper 4 investigates the motivations of NGOs to participate in the co-creation of public service innovation with government and combines QCA with logistic regression.

Research process

QCA is an iterative process which means that throughout the research process, the researcher goes back and forth between different activities (figure 3). Decisions on the design of the study are informed by theoretical knowledge, but the design can also be adjusted based on insights gained in later stages of the research process. Hence, the thesis does not claim to have developed a universal holistic model for the analysis of co-creation and the effect on public service outcomes. The analytical models in the papers are developed on the bases of the contexts they are applied to and the data available from the survey.

For instance, theory is used for the definition and selection of conditions, while at the same time, the precise definition of conditions can be refined based on in-depth study of the cases (Ragin, 2009). The conditions that are included in the models for papers 2,3 and 4 are those that are both theoretically relevant and were also consistently identified in configurations with good fit, according to accepted parameters of fit in QCA. Parameters of fit in QCA are called consistency and coverage. Consistency refers to the percentage of similar configurations which result in the same outcome. It resembles the notion of significance in quantitative research and measures the extent to which a configuration is a consistent subset of and therefore sufficient for the outcome. Coverage refers to the number of cases for which a configuration is valid and provides a measure of empirical relevance (Ragin, 2006).

Figure 3 Research process with QCA



The analytical part begins with developing an understanding of the cases (Ragin, 2014). This part of the research process thus focuses on within-case complexity. In this study, intimacy with the cases has been achieved through extensive exploration of all the data in the survey, including the qualitative case descriptions provided by the respondents. These descriptions entail information about what the innovation is about, and which actors were involved. Due to confidentiality issues, it was not possible to include this information in the papers, but it did serve to inform the researcher's decision during the selection of the cases and the calibration phase. In addition to the case descriptions from the Co-VAL surveys, the Co-VAL project also produced a rich catalogue of background material, including detailed descriptions of case studies and a report on the interviews with survey respondents in relation to the cognitive testing of the survey questions.[1] This information also served to inform the research process in this thesis.

Case selection

Another qualitative element in QCA is that the cases must be selected purposefully, rather than randomly, as is done in quantitative research. The first aim is to select cases that are similar enough to compare. This depends on the outcome one wants to study. The outcome in the research model often implies how or against which background characteristics cases have to be sufficiently similar. Due to the heterogeneous data in the Co-VAL survey, I explored sub-samples that have similar characteristics. Exploratory data analysis in connection with papers 2 and 3 showed significant differences between countries in the sample. It was thus interesting to concentrate the analysis on individual countries. In connection with paper 2, significant differences were also found between levels of government (local and national),

[1] The Co-VAL publication database can be accessed here: https://www.co-val.eu/public-deliverables/.

which in turn resulted in focusing the analysis on those levels. Analysing and comparing the same phenomenon in different contexts gives us a broader and more general understanding of it (Wagenaar, Kieslich, Hangel, Zimmermann, & Prainsack, 2022).

Within the area of homogeneity, cases with and without the outcome and with and without the conditions of interest are needed. Variation in the outcome is specifically important because with asymmetric causality, which is one aspect of complex causality, the occurrence of the outcome and its non-occurrence must be assessed separately. It is also important to ensure that the cases are heterogeneous and not too similar, to avoid problems of limited diversity and ensure that the analysis captures the full range of possibilities. In sum, the challenge is to purposefully select cases that are homogeneous on the background characteristics and heterogeneous on the conditions and outcome (Ragin, 2009; Schneider & Wagemann, 2010, 2012).

Calibration

The research process continues by building knowledge about the selected cases and then moves on to what is called calibration. In the calibration phase, the researcher gives scores to cases which reflect whether, or the extent to which, cases are members of sets, using the interval between 0 (no membership) and 1 (full membership) (Rihoux & Ragin, 2008; Schneider & Wagemann, 2012). Dichotomous conditions are thus easy to include in QCA, while discrete or continuous conditions have to be calibrated into either high (1) and low (0) levels (based on a chosen crossover point) or ranked "discrete-wise" from 0 to 1 (e.g., .33 would indicate "more out than in, but still somewhat in", whereas .7 would signify "more in than out, but not entirely in" the same set), where the crossover point for set membership is 0.5. In the three QCA-papers included in this thesis, the analysis entails both dichotomous and continuous conditions.

The crossover point (0.5) of being in or out of a set should ideally be determined based on previous research and theory. However, when a study is exploratory by nature due to a lack of prior empirical research, as is the case for this thesis, calibration can be based on sample statistics. The most common approaches include using the median as the crossover point or employing rank order methods (Merguei, 2022). I used the rank order command (stdrank) in STATA for calibration in connection with papers 3 and 4, which rank-orders the values in the condition and then normalises them. The standardisation consists of subtracting the rank value with the minimum rank and dividing the outcome by the difference between the maximum

and minimum ranks. This method of calibration can help to reduce the impact of outliers and differences in measurement units across conditions. In connection with paper 2 the calibration approach follows the indirect method of calibration proposed by Ragin (2000, p. 156; 2008) using value logic schemes.

Interpretation of the results

The set membership scores are subsequently transformed into a data matrix known as the truth table. The truth table indicates which combinations of present and absent conditions lead to the outcome. It is possible that the truth table includes rows with logical remainders, which are combinations of conditions with no empirically observed cases. However, in this thesis, only rows with at least one empirical case were included in the analyses.

With the help of Boolean algebra, the process of logical minimisation systematically compares combinations of conditions in the truth table. The number of rows is reduced in line with (1) the minimum number of cases required for a solution to be considered and (2) the minimum consistency level of a solution. For sufficiency analysis in fuzzy sets, the minimal threshold for consistency is 0.75, but it can also be higher (Fiss, 2011; Ragin, 2006). By making such a comparison, a broader understanding can be obtained regarding which conditions or combinations of conditions are responsible for producing the outcome. The process of logical minimisation leads to the "minimal formula." This formula indicates which absent and present conditions, and which combinations of absent and present conditions are sufficient to produce the outcome across cases. Each final solution is then evaluated concerning its coverage of the outcome. I used both the fsQCA software (papers 2 and 4) and the Stata program “fuzzy” (paper 3) to conduct the analyses. The interpretation of the results is based on the parsimonious solution term, because it is the most minimal combination of conditions that can explain the outcome and thereby the easiest to interpret in terms of causal relationships (Baumgartner, 2021; Rihoux & Ragin, 2008). By focusing on the minimal combination of necessary and sufficient conditions, the parsimonious solution provides a clear understanding of the core factors driving the outcome (Fiss, 2011). This simplicity enhances the communicability of the research findings and their practical implications.

To understand the minimum formula properly, it has to be interpreted in the context of the cases. This thesis applies a condition-oriented approach to QCA in which cases are understood as sets of conditions (Thomann & Maggetti, 2020). Inference is drawn from cross-

case relations between sets and from conceptual relationships. The results are interpreted as patterns across cases and are not supplemented with qualitative in-depth analysis of individual cases even though the qualitative case descriptions have served to interpret the meaning of the results. Statistical techniques were used in the exploration of the data and the evaluation of the QCA models in order to strengthen the robustness of the results. In addition, the results were tested for their robustness by systematically adding and dropping conditions, varying consistency thresholds and by testing different forms of calibration.

4.3 Survey design and data collection

The research for this thesis is essentially based on data in work package 2 (WP2) provided by the Co-VAL research project, "Understanding value of co-creation in public services for transforming European public administration (Co-VAL)" which was conducted as part of the Horizon 2020 project. It includes a large-scale survey of public administration managers (main Co-VAL survey) responsible for innovation projects and a smaller survey of managers of NGOs and other organisations (pilot survey) from six countries.[2]

The main objective of Work Package 2 (wp2) in the Co-VAL project was to develop, test and utilise a quantitative measure of co-creation. This process began by extensively researching and reviewing surveys that had previously included indicators for co-creation, although very few innovation surveys had done so. Additionally, each country representative within wp2 searched the national literature for relevant information and provided a report to the wp2 leader. Based on this collective effort, a comprehensive measure of co-creation was developed. The measure then underwent qualitative cognitive testing, as mentioned in paper 1, and was adjusted through two rounds of interviews in each country (with ten interviews conducted in each country). Following these adjustments, the measure was implemented in the survey.

Experience from working with the surveys served as a background for the work on paper 1. The large-scale survey of public administration managers was the data basis for papers 2 and 3. Data from the survey of managers in non-governmental organisations is used in relation to paper 4.

Main Co-VAL survey

[2] The complete questionnaires and survey results from both surveys are available in the report "D2.8 Final report of survey results" (Arundel & Es-Sadki, 2021).

The main survey was sent to public sector managers in municipalities and national government organisations in six European countries: France, Hungary, Spain, the Netherlands, Norway and the UK. The countries cover a variety of conditions in terms of size, economic development and political structure. The survey target population consisted of public sector managers within national and municipal governments who were likely to be actively involved in the development and implementation of service innovation. The population of eligible managers was identified using organograms available on government websites. Following other research of public sector innovation, the top management level was excluded in order to ensure that respondents were actively involved in innovation projects (Wagner, Rau, & Lindemann, 2010; Walker, Berry, & Avellaneda, 2015).

Respondents were asked to only respond for their area of responsibility, defined as their work unit. The organisation is the government entity that employs the respondent and could be an agency, ministry or department within a municipality or national government. Government departments responsible for the following activities were eligible for inclusion: education, transport, housing and community services, health and social care, culture and recreation, environmental services, including parks, water and climate change; and business, energy and industry. Departments that were unlikely to develop services, such as those solely responsible for internal corporate services, regulation and governance, etc., were excluded.

The survey of public administration managers is the first survey that asks respondents to describe the most important innovation they have implemented, followed by several questions that focus on this most important innovation. Those questions concern, for instance,

- Organisational factors such as senior management's and employees' attitude towards innovation.
- Questions regarding the characteristics of the most important innovation. The innovation types include four types of services and four processes.
- Political and social influences on the most important innovation, including on the source of the idea for this innovation and on the drivers for this innovation.
- Inputs to the most important innovation, including whether the work unit received extra funding or staff to develop that innovation, or whether the work unit obtained assistance from external sources to develop that innovation.
- User involvement in the development of the most important innovation.

During the exploratory analysis of the data in the survey, all questions theoretically relevant to co-creation were operationalised as conditions and tested, but only conditions that were consistently identified as relevant during the exploratory analysis were included in the final models.

The survey also asked about the effects of the most important innovation on nine outcomes, of which five are internal outcomes that affect government processes (simpler procedures, reduced costs, etc.), three affect users (user experience, user access to information, and service quality) and one affects both internal processes and users (safety of employees or individuals). Since this thesis focuses on service innovation, not process innovation, the most relevant outcome categories are those that affect users of the service. Hence, outcomes that are mainly related to internal processes were not included in the analyses for this thesis.

Only innovative work units were asked to answer questions regarding the most important innovation. This approach has been used in innovation surveys in both the private and public sectors (OECD/Eurostat, 2018). Focus on a single innovation can give data of better quality for innovation inputs and outputs, because it does not require the respondent to make averaged estimates for multiple innovations. The survey also contained qualitative descriptions of the individual innovations provided by the respondents. Innovation was defined as a new or improved service or process that differs significantly from the work unit's previous services or processes. The descriptions were used to classify each innovation as either a service or process-only innovation. In this way, the classification of the innovations did not depend on the respondent's knowledge. The majority (64%) of the reported innovations could be classified as service innovations. Due to confidentiality concerns, the exact case descriptions cannot be included. Examples of innovations involve, for instance, the development of systems and competence to detect and prevent bullying in kindergartens, or the development of a certification system for nursing homes. Many of the innovations described in the survey include an element of digitisation and automation, for instance in the case of application processes for government grants, information services or application for building permits, or self-service websites.

The main Co-VAL survey was conducted as a statistically representative sample and obtained responses from 1,036 public sector managers in six European countries, of whom 788 were from innovative work units that answered questions on their most important innovation. After removing cases with missing replies from the analysis, the Norwegian data sample consists of

85 cases of service innovation and the Spanish data sample consists of 93 service innovation cases at both local and national government level. National government services covered by the survey include, for instance, inspection activities; planning, operation, and management of public roads and infrastructure; grant management for the cultural sector; flood, landslide, and avalanche alerts; and accreditation and approval of foreign education and training. Local government services covered by the survey include, for instance, schools and libraries, health care, social work and child welfare, education programmes for children with special needs, water and sewage services, nursing homes for the elderly, and day care for young children. Compared to users of national government services, users of local public services are more often individuals (citizens and residents), while users of national public services are more often other organisations and businesses.

NGO pilot survey

The Co-VAL pilot survey of non-governmental organisations (NGOs) collected a total of 99 valid responses from six countries: France, Hungary, the Netherlands, Norway, Spain and the UK. But nearly half of the responses belong to Norway and Spain, with 24 replies each. The average response rate for completed responses is 28.4%, with considerable variation by country, from 6.9% for the UK to 60.0% for Norway. Due to the absence of a statistical definition of an NGO and population data for NGOs in each country, it was not possible to obtain a representative sample. Instead, a list of NGOs in each country was constructed from web searches using terms such as ‘charities’, ‘NGOs’ and ‘non-profits’ and from existing lists of national NGOs, if available. To be included in the survey, NGOs needed to provide social, health, education or housing services to individuals in the country where they were located and have a minimum of ten staff members. This information was obtained from the NGO website. NGOs that did not provide services to individuals within the country of location, or which only advocated or lobbied for social or political change were excluded. The survey questionnaire was translated into the national languages and underwent cognitive testing in the UK, Spain, Norway and the Netherlands (two cognitive testing interviews per country). After both major and minor revisions as a result of the cognitive testing, the final version of each questionnaire was also translated into the national languages.

The survey is the first of its kind to provide data on the contribution of NGOs to public sector innovation. The pilot survey collected information on 1) NGO activities to develop their own service innovations and 2) NGO involvement in service innovation under development by

public sector agencies. Respondents were asked if their NGO had developed or implemented each of eight types of new or improved services for citizens or residents plus an 'other' category in the previous two years. The questionnaire also asked respondents whether their organisation had provided advice, expertise, data or other inputs to assist a local, regional or national government organisation in developing a new or improved service. In addition, respondents were asked to describe "the most important new or improved service by a government for which your organisation provided input", with importance defined in terms of the "expected or realised benefits of this service to citizens or residents". All of the following questions referred to this single, focal innovation in order to improve data quality and accuracy (OECD/Eurostat, 2018, chapter 10). Respondents whose NGO assisted a government service innovation were asked about seven methods of contributing to the development of the innovation, plus an "other" option. Eligible respondents were furthermore asked about the importance of seven reasons for their NGO participating in the development of public service innovation, plus an "other" category. The questionnaire also asked respondents about the resources they spent on developing the most important innovation, such as the receipt of government funding. Finally, the questionnaire also included a question about the intended effects of the innovation on six categories of outcome and one "other" option with two of the outcome categories focusing on improving the service experience of the user.

4.4 Operationalisation and calibration of outcomes and conditions

1. Outcomes

Paper 2 and paper 3 use the outcome variable "high level of positive effects on outcome from service innovation", which consists of four service outcome categories including user experience of a service, user access to information, safety of employees or individuals (citizens, residents, etc.), and service quality. Respondents were asked to assess the effects of their most important service innovation on these outcomes, and it was possible to report either positive, neutral, or negative effects. In the context of this thesis, we are interested in positive effects on outcome from innovation. Full membership in the set "high level of positive effects on service outcomes" was achieved when all four outcome categories showed positive results.

In paper 4, we are interested in whether NGOs act as co-creating partners in public service innovation projects by substituting for or assisting in user-co-creation. The outcome variable applied in paper 4 is thus a high level of NGO participation in the co-creation of public

service innovation projects including four types of active participation in connection to different stages of the innovation process: participation in brainstorming and idea generation workshops, assisting with the design of the new or improved service, participating in tests of how people experience or user a prototype of this service, and participating in an evaluation of the service after its implementation. Full membership in the set "high level of NGO participation in co-creation activities" was achieved with participation in all four types of contribution.

2. Drivers of innovation development

One question in the main Co-VAL survey covers drivers of the development of the most important innovation, including demand from individuals. The response options were high, medium, low and no (none) importance as well as a "Don't know" option. The importance of demand from individuals as a driver of the innovation was included as a dichotomous condition in paper 3. Both medium and high responses were categorized as members of the set "high importance of demand from individuals as driver of innovation development". Innovation development based on individual demand cannot be categorised as a method of user involvement per se, but it is an interesting aspect that relates to the importance of citizens and residents for the development of that innovation and has therefore been considered a relevant condition in the context of this thesis.

3. Methods for involving users in innovation activities

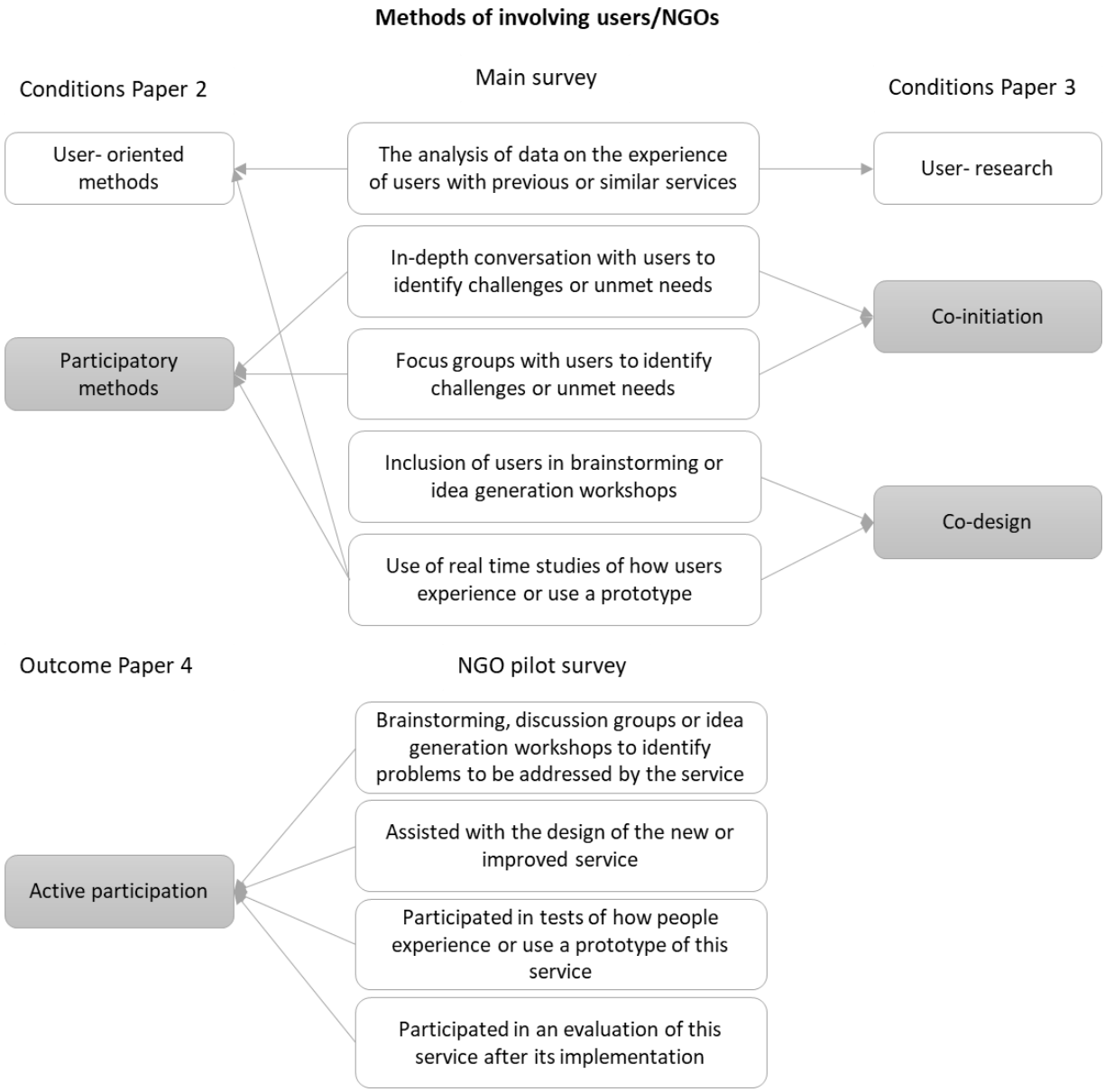
In the main Co-VAL survey, respondents were asked to report on the use of five methods of involving users in the development of the most important innovation: analysis of data on the experience of users, one-to-one in-depth conversations, focus groups, the inclusion of users in brainstorming or idea generation workshops, and real-time studies of how users experience a prototype of the innovation. In connection with paper 2, these methods were separated into participatory methods and user-oriented methods. The condition "participatory methods" consists of three participatory methods for obtaining user input: in-depth one-on-one research with users, focus groups with users, and the participation of users in brainstorming workshops. The condition "user-oriented methods" consists of two methods for obtaining information on user experience: analysis of data on the experience of users with previous or similar services, and real-time studies of how users experience or use a prototype of the innovation. In connection with paper 3, methods of involving users were differentiated by the stage of the innovation process that they represent: "user research", "co-initiation" and "co-

design". User research includes the analysis of data on the experience of users with previous or similar services. Co-initiation includes two methods of user involvement: the use of "in-depth conversations with users to identify challenges or unmet needs" and "focus groups with users to identify challenges or unmet needs". Both user research and co-initiation can be assigned to the research or problem-finding phase of the innovation process, however, user research does not involve users directly, whereas co-initiation does involve users directly. Co-design includes one method linked to the ideation stage of the innovation process: the inclusion of users in brainstorming or idea generation workshops; and one method that can be related to the development phase of the innovation process: the use of real time studies of how users experience or use a prototype of the innovation. All user involvement conditions are calibrated discrete wise as continuous conditions. Full membership in a set that indicates high level of use was achieved when all the methods in that specific category were used.

In connection with paper 4, the form of NGO contribution to public service innovation processes is divided into active NGO participation whereby NGO staff draw on their understanding of user needs to directly contribute to four co-creation activities, and non-participatory input to innovation processes where NGO staff are not actively involved in co-creation activities. As mentioned above, active NGO participation is the outcome variable in paper 4, whereas papers 2 and 3 apply co-creation and user involvement methods as conditions.

The reason for operationalising co-creation differently in these papers was to show that it is possible to operationalise from different perspectives, e.g., participatory vs. non-participatory and innovation stages. Figure 4 summarises the operationalisation of user- and NGO involvement methods in the three empirical papers. The grey boxes represent those methods and forms of contribution that are defined as co-creation.

Figure 4 Operationalisation of methods for involving users or NGOs in public service innovation processes



4. Assistance from external sources

The main survey included a question concerning any input in the form of assistance, advice, technology, or other forms of input from outside the work unit in the development of the innovation. Possible sources were other government organisations, universities and research institutes, businesses and consultants, design firms, innovation labs and living labs, and ICT firms and software suppliers. The five sources were aggregated into one continuous condition representing the degree of assistance from external sources. This condition was used in both outcome related analyses (papers 2 and 3). Although assistance from external sources cannot

be categorised as co-creation without further information on the form of assistance, it is an indication of a collaborative innovation strategy that is presumed to have positive effects on innovation outcomes. Full membership in the set "high level of assistance from external sources" was achieved when all the five external sources provided input in the development of the innovation.

5. Design thinking

Co-creation is often applied as part of a design thinking framework. Each stage of the design process may involve co-creation with users and the application of a design thinking framework is likely to involve service users at multiple stages. The main survey had questions about the methods that were used to develop the most important innovation and included five methods that are part of a design thinking process, namely conducting research to identify challenges, conducting research to identify different types of users, brainstorming or idea generation to identify solutions, developing a prototype of the innovation, and pilot testing of the innovation. All design thinking methods were aggregated into one variable representing the degree of "design thinking" used during the development of the innovation. A high degree of design thinking is likely to involve co-creation with users. This condition was included in the analysis in paper 2 and calibrated continuously. Full membership in the set "high degree of design thinking" was achieved when all the design thinking related methods were applied during innovation development.

6. Organisational innovation support

The main survey includes questions concerning the effects of practices to support innovation at the organisational level on the attitudes of senior management towards innovation and the attitudes of employees towards their work. Three categories have been aggregated into one condition representing the degree of management support of innovation: "Senior management gives high priority to new ideas or new ways of working", "senior management supports taking risks in order to innovate", "senior management supports an innovation culture that includes all employees in innovation activities".

Two questions have been aggregated into one condition representing the degree of employee engagement: "Employees are highly motivated to think of new ideas and take part in their development", and "Employees have a sense of empowerment and ownership of their work".

These two conditions (management support of innovation and employee engagement) were calibrated continuously and are included in the analysis in paper 3. Full membership in the sets high level of management support of innovation and high level of employee engagement was achieved when the respondents answered that all the statements in either category fully apply to their organisation.

7. Input of extra resources

The main survey asks a question about the input of extra resources during innovation development. The condition "input of extra resources" includes the allocation of both additional funding and/or additional staff during innovation development and was transformed into a dichotomous condition. This condition was applied in paper 2.

8. Level of government

The main survey includes information on the level of government for each respondent. This information was used to construct a dichotomous condition representing the level of government (national/local). This condition was included in paper 2.

In relation to paper 3, I used a different strategy to distinguish between configurations for two countries, Norway and Spain. Instead of including a condition representing the country, I conducted individual analyses for separate country-samples. This reduced the number of conditions included in the analysis and thereby the complexity of the results.

9. Experience with developing service innovation

The NGO pilot survey asked respondents whether their NGO had developed or implemented each of eight types of new or improved services for citizens or residents plus an 'other' category in the previous two years. This question was transformed into a continuous condition representing the degree of NGO experience with innovation development.

10. Motivation to participate

Eligible respondents were asked about the importance of seven reasons for their NGO to participate in the development of this new or improved government service innovation, plus an 'other' category. These reasons to participate are aggregated into three types of motivations: an external motivation to improve user experience of the innovation and community acceptance, learning opportunities for the NGO to gain insights or experience, and internal benefits for the NGO, such as an improved relationship with government, networking

opportunities and funding. These three types of motivation are included as dichotomous conditions in the analysis in paper 4.

The survey also includes a separate question as to whether the NGO is expecting to receive government funding to provide this new or improved service to citizens or residents, which could provide an additional motivation to participate in co-creation activities. This question was transformed into a dichotomous condition and also included in the analysis in connection with paper 4.

11. Size

The sixth condition used in paper 4 is the size of the NGO, which may affect the amount of resources that each NGO has available to participate in resource-intensive co-creation activities. The size measure is based on the number of paid employees and the number of unpaid volunteers in the NGO. The two measures have been aggregated into one continuous condition representing the size of the NGO.

Table 2 summarises the outcomes and conditions that were applied in the empirical papers. As mentioned earlier, the selection of the conditions is a result of both theory and insights gained at later stages of the analytical process. It is therefore not surprising that the conditions in paper 2 and paper 3 differ, even though the outcome is the same.

Table 2 Overview of outcomes and conditions applied in the papers

Empirical paper	Outcomes	Conditions
Paper 2	High level of positive effects on service outcomes	1. Participatory methods 2. User-oriented methods (User involvement) 3. Assistance from external sources 4. Design thinking 5. Input of extra resources 6. Level of government
Paper 3	High level of positive effects on service outcomes	1. Individual demand as driver of the innovation 2. User research 3. Co-initiation 4. Co-design (User involvement) 5. Assistance from external sources 6. Management support of innovation 7. Employee engagement
Paper 4	High degree of NGO participation in the co-creation of public service innovation	1. NGO in-house experience with innovation development 2. Internal benefits 3. External motivation 4. Learning opportunities (Reasons to participate) 5. Expectation of funding 6. NGO size

5

5. PUBLICATIONS

This chapter presents the four publications included in this thesis, that together contribute to answering the research questions. The first paper of this thesis gives insights into how the use of co-creation during innovation can be operationalised and measured and provides an operational definition that serves as a starting point for the measurement of co-creation in different innovation contexts. This is an important background for the empirical papers 2-4. Based on the foundation provided by paper 1, the empirical papers 2, 3 and 4 apply measures of co-creation analytically. Figure 5 illustrates the connection between the papers in the thesis.

Figure 5 Connection between the papers in the thesis

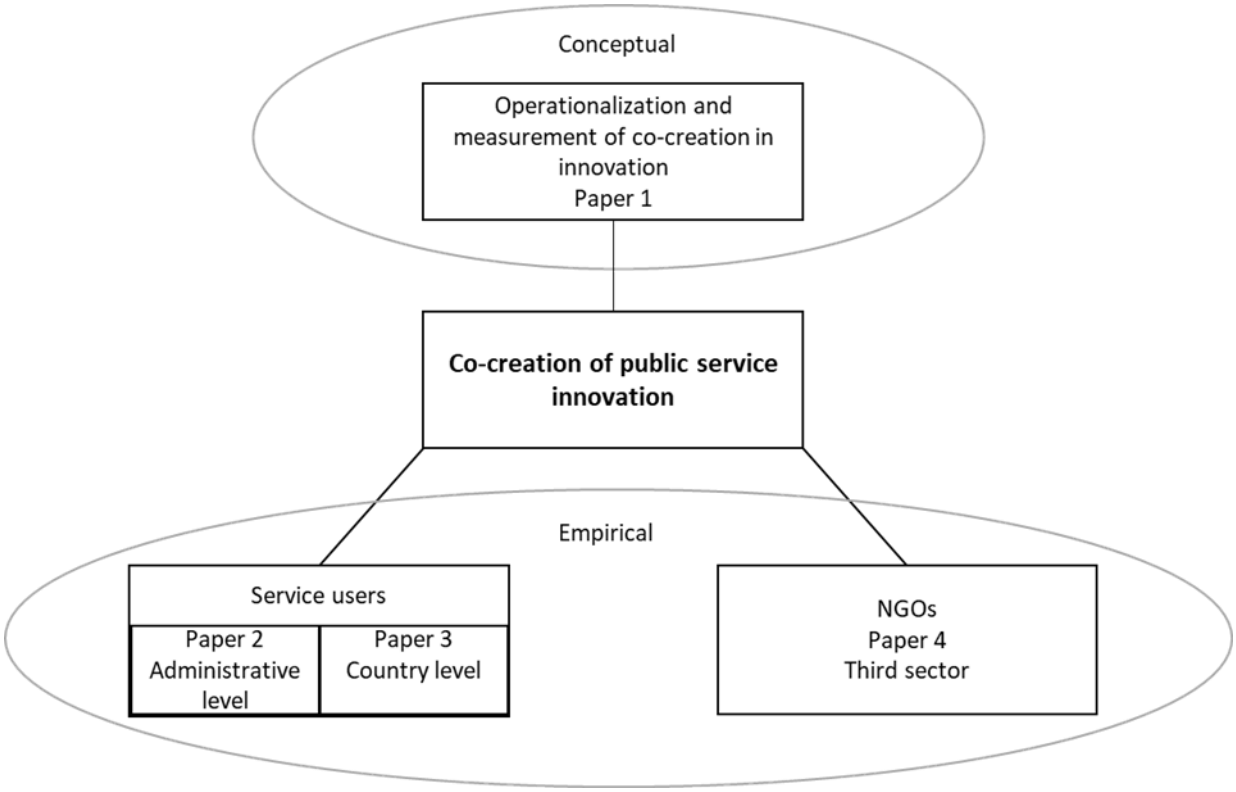


Table 3 presents an overview of the topic and aim of each paper as well as the context, method, data source and publication status.

Table 3 Overview of the research papers

Paper title	Author(s)	Paper type	Context	Method and source of data	Topic and research aim	Publication status
Measuring the use of design thinking and co-creation in innovation.	Anne J. Nordli Stefanie Gesierich	Conceptual	International, Public and private sectors	Researching existing literature and available international surveys as well as experience with the Co-VAL survey	Conceptualizing co-creation and design thinking for the development of indicators and measurement tools for use in innovation surveys	Accepted for publication in the second edition of the Handbook of Innovation Indicators and Measurement
Investigating effects of co-creation on outcomes of public service innovation- a comparative analysis at the national and local government level in Norway	Stefanie Gesierich	Empirical	Norway, level of administration (national/local)	Qualitative comparative analysis on main Co-VAL survey data	A comparison of local and national government levels in Norway concerning the use of co-creation methods and configurations of co-creation in successful public service innovation projects	Published in Scandinavian Journal of Public Administration
Approaches to co-creating successful public service innovations with citizens: A comparison of different governance traditions	Stefanie Gesierich	Empirical	Norway and Spain, tradition of governance	Qualitative comparative analysis on main Co-VAL survey data	A comparison of approaches to user involvement in public service innovation projects in Norway and Spain and the likely influence of their administrative tradition on these approaches.	Published in Public Money and Management
Contractor or co-creator? An empirical analysis of the role of NGOs in public sector service innovation	Stefanie Gesierich Anne J. Nordli Anthony Arundel	Empirical	Six European countries, third sector	Qualitative comparative analysis on Co-VAL pilot survey data	Investigating the role of NGOs in public service innovation projects and their reasons to participate in co-creation activities with government	Submitted to review

Paper 2 assesses and compares the effect of co-creation on service-related outcomes of public service innovation in the context of the national and local governance level in Norway. Norway is the country with the highest response rate from the Co-VAL survey, which makes the responses more likely to be representative of their population. Furthermore, initial descriptive statistics showed significant differences in the use of co-creation related input factors between levels of government (national/local) in Norway. This makes it interesting to focus on whether successful public service innovation follows different configurations depending on the level of government in Norway. Another reason for focusing particularly on Norway is that the Scandinavian countries have a reputation for being at the forefront when it comes to participatory user design in public service innovation (Mureddu & Osimo, 2019; Sanders & Stappers, 2008). I have therefore been particularly interested in Norway, as the Scandinavian representative in the Co-VAL survey. Paper 3 assesses and compares the effect of co-creation on service-related outcomes of public service innovation in two different countries that represent different governance traditions (Norway and Spain). The reasons for focusing on comparing two countries is that there are significant differences between the countries for several of the aspects on which the survey is focused i.e. co-creation with citizens. It is thus interesting to focus the analysis on comparing these differences and on discussing whether they might be related to differences in the administrative traditions of the two countries. In addition, there was a huge difference in response rates from each country. Norway, followed by Spain, had the highest response rate, while the response rate for other countries, such as the UK, was very low. The responses for Norway and Spain are thus the most likely to be representative of their populations. Paper 4 focuses on the role of non-governmental organisations in the co-creation of public service innovation as one important contributor to the development of public services and analyses the reasons that drive NGO participation in co-creation activities with public organisations during innovation development.

Papers 2, 3 and 4 contribute to answering RQ2 by providing data on the prevalence of co-creation in different public service innovation contexts. Papers 2 and 3 contribute to answering RQ3 by analysing the relationship between the use of co-creation methods in combination with other factors and positive effects on innovation outcomes. Paper 4 also contributes to answering RQ3 by analysing the conditions under which NGOs participate in the co-creation of public service innovation. Papers 2, 3 and 4 contribute to answering RQ4 by discussing how different contexts (government level, administrative tradition and

governance paradigm) might impact co-creation in public services. Papers 2, 3 and 4 thus also contribute to answering RQ1 by showing how co-creation can be operationalised in different ways. Figure 6 illustrates the relationship between the papers and the research questions.

Figure 6 The four papers and their relationship with the research questions

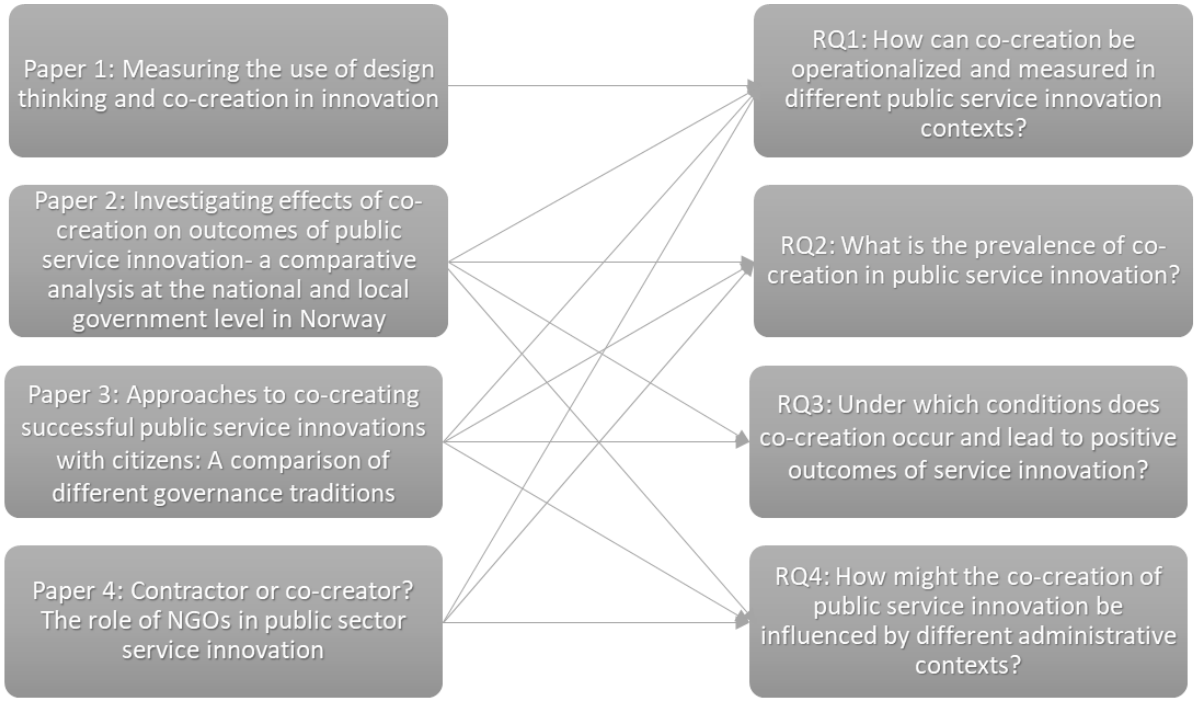


Table 4 gives an overview of the contributions of each paper in relation to each research question.

Table 4 Contribution of each paper to the research questions

Paper	Contribution to RQ1	Contribution to RQ2	Contribution to RQ3	Contribution to RQ4
1	Provides an operational definition of co-creation and discusses how co-creation relates to other concepts. Gives suggestions for measurement of co-creation.	Provides the conceptual basis and definition of co-creation as a starting point for the operationalization of co-creation in different contexts	Provides the conceptual basis and definition of co-creation as a starting point for the operationalization of co-creation in in different contexts	Provides the conceptual basis and definition of co-creation as a starting point for the operationalization of co-creation in different contexts
2	Operationalization of co-creation and practical application of co-creation measurements	Provides empirical data on the use of co-creation methods at national and local government levels in Norway	Service outcome oriented comparative analysis of the conditions under which co-creation positively affects these outcome at local and national government levels in Norway	Discussion of how the level of administration might impact the use and effect of co-creation in public service innovation
3	Operationalization of co-creation and practical application of co-creation measurements	Provides empirical data on the use of co-creation methods in Norway and Spain	Service outcome oriented comparative analysis of the conditions under which co-creation positively affects these outcomesin Norway and Spain	Discussion of how the administrative tradition and culutre of governance might impact the use and effect of co-creation in public service innovation
4	Operationalization of co-creation and practical application of co-creation measurements	Provides empirical data on the involvement of NGOs in the co-creation of public service innovation	Analysis of the conditions under which NGOs actively participate in co-creation activities in public service innovation	Public service innovation in the context of the third sector and the possible impact of governance paradigms on the role of NGOs in public service innovation

The following sections summarise the four dissertation papers in more detail. The full versions of the four publications are included in the appendix.

Paper 1: Measuring the use of design thinking and co-creation in innovation

Authors: Anne Jørgensen Nordli & Stefanie Gesierich

Publication status: Accepted for publication in the second edition of the Handbook of Innovation Indicators and Measurement

Background and research aim: Design thinking and co-creation have gained increased attention in innovation research and practice. The increase in the use of design thinking and co-creation methods in both the private and public sectors has led to several qualitative studies to increase our understanding of their role in innovation. However, the literature identifies several areas where more research is needed, such as the prevalence of co-creation and design thinking practices, the effect of co-creation and design thinking on innovation outcomes in the public sector (Krogh *et al.* 2020; Torfing *et al.* 2019; Voorberg *et al.* 2015), and the conditions under which co-creation leads to successful innovation, such as the stages of the innovation process and the degree and way in which stakeholders are involved at the different stages (Gemser and Perks, 2015; Voorberg et al. 2015). Quantitative studies based on surveys could help to advance research on these topics (Gemser and Perks, 2015; Krogh *et al*. 2020), since this method allows generalisation to a greater degree than qualitative studies and investigations of the relationships between different factors. To facilitate this, appropriate scales for measuring design thinking and co-creation need to be developed (Loureiro *et al*. 2020).

Despite the popularity of the concepts, measurement is still in its infancy. Since 1992, Community Innovation Surveys (CIS) have been conducted by national statistics offices in all European countries, based on guidelines in the Oslo Manual. The most recent edition of the Oslo Manual points to the need to measure design activities to develop a new or modified function, form or appearance for goods, services or processes, including business processes to be used by the firm itself (OECD/Eurostat, 2018). Only a few innovation surveys have so far included questions on the use of co-creation or design thinking, because these concepts were not covered in the first, second or third editions of the Oslo Manual. However, the fourth edition (OECD/Eurostat, 2018) now argues for the importance of their measurement, since they can support the innovation activities of both service and manufacturing firms. Due to the nature of design thinking as a working process that focuses on separate stages of a

development process, this paper also seeks to suggest measures that enable data to be obtained for separate stages of the process.

Method: The development of the proposed measures draws on a selection of innovation surveys from the public and private sectors that have explored the measurement of design thinking and co-creation in one or more questions. In addition, we draw on our personal experience with the development, testing, implementation and analysis of the Co-VAL survey. The Oslo Manual also guided work on this paper.

Findings/contribution: The paper addresses how and why the concepts relate to innovation, how the two concepts relate to each other, and how far the work on developing indicators of design thinking and co-creation has come. The paper also provides an operational definition for the two concepts and suggests measures that can be used in surveys by academics or national statistical agencies, or by academics in case studies. The paper suggests how the use of design thinking and co-creation can be measured in innovation surveys without using the words “design”, “design thinking” or “co-creation” in the questions, to avoid basing measurement on the respondents’ own interpretation of these concepts. Furthermore, we suggest how to measure the use of these methods at specific stages of the innovation process, and how to estimate whether companies implement design thinking as a systematic methodology.

The proposed questions capture activities and working methods of relevance to design thinking and co-creation that can be used by organisations to develop and implement innovation, the use of these methods at specific stages of the innovation process, and how to estimate whether companies implement design thinking as a systematic methodology.

Paper 2: Investigating effects of co-creation on outcomes of public service innovation – a comparative analysis at the national and local government level in Norway

Author: Stefanie Gesierich

Publication status: Published in the Scandinavian Journal of Public Administration

Background and research aim: Co-creation in public service innovation is a prominent research field, but few have empirically investigated its effect on the outcomes of innovation. Even though co-creation is advocated as the new innovation paradigm, we still have very little empirical data on the use of co-creation practices and the effect of co-creation on the outcome from innovation (Steen et al., 2018; Verleye, 2015; Voorberg et al., 2015). Nonetheless, the literature on co-creation of public services is overall optimistic with respect to its presumed effects. Proponents claim that close collaboration between service providers and citizens provides opportunities not only for improving the efficiency and quality of public services, but also for enhancing democratisation and trust in government (Røiseland, 2016; Steen et al., 2018). Leading scholars agree that, so far, the research on co-creation in public services has been more focused on which factors influence the emergence of co-creation, instead of assessing and measuring its impact (Callens, 2023; Torfing et al., 2019), and few quantitative studies that have tested the assumption of positive effects of co-creation on innovation (Krogh et al., 2020). In particular, more research is needed on conditions under which co-creation leads to successful innovation, for instance, the extent and the way in which stakeholders are involved (Krogh et al., 2020; Torfing, Sørensen, et al., 2020; Voorberg et al., 2015).

Method: To address these research gaps, the paper presents findings from a comparative analysis which identifies and examines configurations (combinations of input factors) that are linked to positive effects on four outcome categories from service innovation, namely: service quality, user experience of the service, user access to information and safety of citizens and residents. By employing qualitative comparative analysis (QCA) based on a survey of innovation activities of Norwegian public administration agencies, this paper identifies several configurations for local and national authorities that lead to successful service innovation. The study explores how the combinations of innovation input factors differ regarding the level of government (national and local).

Findings: The paper identifies four input factors that can be associated with co-creation, namely the inclusion of user input through participatory and user-oriented methods, the degree of external assistance, and the use of design thinking during innovation development. The main findings suggest a positive relationship between user input and positive effects on service outcomes. However, local and national government levels differ regarding the use of input factors and methods of user involvement. User orientation, external assistance, as well as extra resources appear to be more important at local government level compared to national government level. Nevertheless, the majority of the configurations that lead to successful public service innovation showed no differences regarding the level of government. This means that local and national public organisations have more common than distinctive paths to successful service innovation. The results furthermore show that user-oriented methods have to be combined with other input factors to be sufficient for the outcome. Non-participatory, user-oriented methods, such as the analysis of data on user experience or the observation of user experience in test trials, seems to be the most common form of obtaining input from service users, particularly at the local government level, but occurs only in combination with other input factors. In other words, user-oriented methods are not a sufficient innovation tool alone, but must be combined with either high levels of participatory user involvement, external assistance or extra resources, in order to be successful. Finally, the input of extra resources during innovation development is less important than expected.

Contribution: The paper contributes empirical-based knowledge of the effect of participatory user involvement and other user-oriented methods on public innovation outcomes in different contexts The study contributes to our understanding of the effect of co-creation in different contexts and provides insights into when and how co-creation with users is a useful tool in public service innovation. This is, to the author's knowledge, the first study of the effects of co-creation on innovation outcomes in the Scandinavian context that is based on configurational theory. The study thus contributes to further advance research on the linkages between co-creation and public sector innovation outcomes in different contexts, and the insights may provide guidance to policy makers, as well as public sector officials.

Paper 3: Approaches to co-creating successful public service innovation with citizens: A comparison of different governance traditions

Author: Stefanie Gesierich

Publication status: Published in Public Money & Management

Background and research aim: There is growing acknowledgement amongst researchers and governments that conventional approaches to public service delivery do not respond to the complexity of contemporary societal problems (see for instance Brandsen, Steen, and Verschuere (2018)). The need to transform public service production in order to increase or sustain existing service levels (produce more with less) has led to new forms of collaboration with external stakeholders (Bason, 2018; Hartley, Sørensen, & Torfing, 2013). Co-creation can arise in the early stages of an innovation process, in which problems are detected and defined (co-initiation), or at the stage where solutions and related tools are identified and tested (co-design) (Piller, Ihl, & Vossen, 2010; Røiseland, 2021; Voorberg, Bekkers, & Tummers, 2015). Co-creation is thus understood as the involvement of citizens in the initiation and/or design of public service innovation (Voorberg et al., 2017). However, the actual extent of citizen engagement differs strongly between types of services, organisations and cultural contexts, and attempts by governments to engage citizens are not always successful, or do not result in achieving the desired outcomes of such collaboration (Brandsen et al., 2018). Co-creation can change the way in which governments relate to citizens in a fundamental way, depending on the existing governance tradition. Countries with differing governance traditions thus have different preconditions when it comes to applying co-creation as a public innovation strategy (Voorberg et al., 2017). However, there is limited empirical knowledge of the effect of co-creation on innovation outcomes (Krogh, Sørensen, & Torfing, 2020; Steen, Brandsen, & Verschuere, 2018; Torfing, Sørensen, & Røiseland, 2020; Verleye, 2015; Voorberg et al., 2015) and the relationship between approaches to co-creation and governance traditions (Peralta & Rubalcaba, 2021; Voorberg et al., 2017). Such knowledge is important for understanding why and how co-creation should be implemented in public innovation. Researchers have argued that the distinctive features of the public sector must be considered in innovation research (Fitjar, 2015; Fuglsang & Rønning, 2014; Hartley, 2013). This paper argues that country-specific differences in citizen involvement can be connected to each country's state and governance traditions. The administrative tradition and culture of governance must thus also be considered. Building on Voorberg et al. (2017), the paper investigates how successful public service innovation projects differ in their approach to

citizen involvement and discusses whether this can be explained by the country's dominant state and governance tradition. The research questions are:

1. Can co-creation be associated with positive outcomes of public service innovation?
2. What are the differences between countries regarding their co-creation approaches with citizens in public service innovation?
3. How might these differences be connected to governance traditions?

Method: Using data from a large-scale survey of innovation activities in public service organisations, the study explores how different factors (i.e., different forms of co-creation with citizens, management support and the intensity of input from external sources) combine to form successful innovation strategies, and compares how these strategies differ between countries through the application of qualitative comparative analysis (QCA). To illustrate how differences in approaches to user involvement in public service innovation might be connected to each respective country's administrative tradition and culture of governance, the analysis focuses on comparing two countries that represent differing governance traditions: Norway and Spain.

Findings: The results reveal a positive relationship between co-creation and the outcomes of public service innovation. In addition, there are several paths to positive service innovation outcomes including different forms of citizen involvement. While individual demand is an important driver of innovation in Spain, Norway relies more on facilitated co-creation with service users at the ideation and design stage of the innovation process.

Contribution: The paper adds to a small number of empirical studies that have analysed the effect of co-creation on innovation outcomes, using quantitative data and discusses the findings in the light of governance traditions and approaches to co-creation in public innovation projects (Peralta & Rubalcaba, 2021; Voorberg et al., 2017). The paper contributes to our understanding of why and how co-creation has been implemented differently in different countries and adds to our knowledge of the effect of co-creation on the outcomes of public service innovation in different contexts. As one of the first international comparative studies of co-creation in innovation concerning effects on public service outcomes using quantitative data, this study supplements the dominantly normative literature in this field by providing empirically based insights.

Paper 4: Contractor or co-creator? The role of NGOs in public sector service innovation

Authors: Stefanie Gesierich, Anne Jørgensen Nordli, Anthony Arundel

Publication status: In review

Background and research aim: Research of the role of non-governmental organisations (NGOs) in public service innovation has received renewed interest at a time when many governments struggle to meet citizen expectations to provide innovative solutions to societal problems (Andreassen, 2008; Merlin-Brogniart et al., 2022; V. Pestoff & Brandsen, 2010). Collaboration with NGOs may enable public organisations to gain better insights into user needs and how services can be developed more effectively. Previous research suggests that the role of NGOs in public innovation might be changing from a contractor role for outsourced public services towards a more collaborative approach in which public services are increasingly co-created with NGOs and other actors (Brock, 2020; Rønning et al., 2022; Torfing, Andersen, Greve, & Klausen, 2020). The recent renewed focus on the role of civil society actors in collaborative public innovation may be linked to the emergence of a New Public Governance (NPG) paradigm in which civil society is recognised as a valuable resource for public service provision and innovation (Brock, 2020; Loga, 2018; V. Pestoff & Brandsen, 2010). However, there is little research, particularly in the form of empirical, quantitative studies about the extent to which NGOs engage in the co-creation of public service innovation and what their motivation is for doing so (Ibsen, 2021, p. 10; Osborne, Chew, & McLaughlin, 2013; V. A. Pestoff, Brandsen, & Verschuere, (Eds.) 2012). The purpose of this article is therefore to investigate how non-governmental organisations contribute to public service innovation and the reasons that motivate NGOs to participate in the co-creation of public service innovation.

Method: This article uses data from a pilot survey of NGOs in six European countries to explore the involvement of NGOs in the development of public sector service innovation, and to investigate what motivates NGOs to participate in their development, by use of qualitative comparative analysis (QCA) and logistic regression.

Findings: The analysis finds that NGOs play an important role in public sector service innovation, by acting as co-creation partners for public service innovation, but also by developing service innovation for citizens and residents themselves. The main motivation for NGOs to participate in the co-creation of public service innovation is to improve the user's experience of the service. Additionally, we find that the most innovative NGOs use these co-

creation arenas as learning opportunities to gain experience from developing service innovation and to gain insights into user needs. The reviewed literature concentrates mainly on NGOs' contribution to public service innovation on the basis of their perceived organisational advantages and by providing input and insights in connection with user needs and service experiences (Enjolras & Solbu Trætteberg, 2021; Pestoff & Brandsen, 2010). We confirm this role of NGOs, but also note the importance of the transfer of knowledge from public organisations and public innovation processes to NGOs. Our research indicates that participating in public service innovation projects presents learning opportunities in connection with gaining experience from service development and gaining insights into user needs. Such insights should foster the innovative capacity of NGOs.

Contribution: The article contributes to our empirical knowledge of the role of NGOs in public service innovation and our understanding of the conditions in which NGOs take part in co-creation activities with governments, providing a valuable supplement to the dominantly theoretical and case-based literature. These insights might be used to foster NGO engagement in public service innovation. The high degree of service innovation development by NGOs and the relatively high degree of NGO participation in public service innovation projects, as indicated by the findings in this paper, suggest that more research should focus on the role of NGOs in the development of (public) service innovation.

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6. DISCUSSION

The overall aim of this thesis is to contribute to the gathering of policy relevant metrics of co-creation in public service innovation as well as to advance our understanding of the concept in that context. More specifically, the thesis focuses on contributing to the conceptual understanding of co-creation in public service innovation contexts, and to the understanding of the conditions in which co-creation unfolds and positively affects service innovation outcomes, by focusing on four different research questions. The following sections discuss the main findings in relation to these four research questions. The chapter ends with a concluding summary.

1) **How can co-creation be operationalised and measured in different public service innovation contexts?**

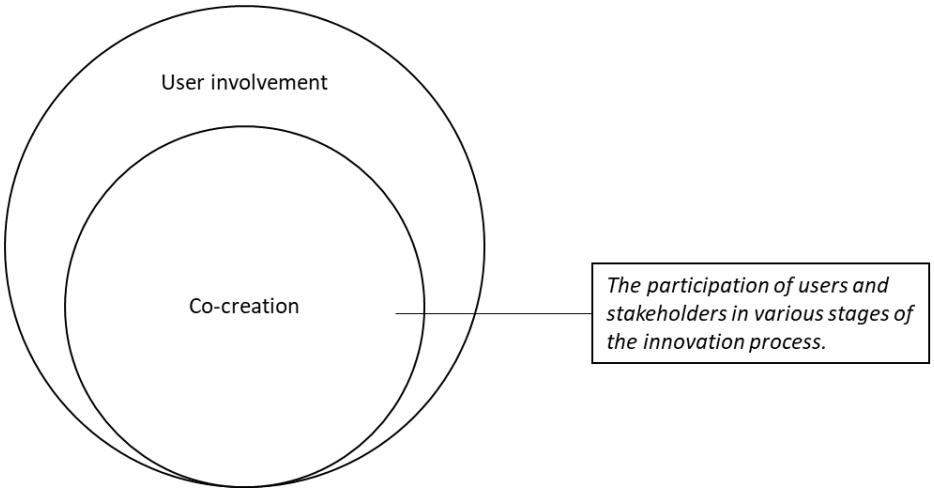
As mentioned in the literature review, it has been pointed out that co-creation theory is characterised by a lack of a single, common conceptualisation and clear definition of co-creation (Jukić et al., 2019; W. H. Voorberg et al., 2015; Aastvedt & Higdem, 2022) and that this provides a challenge for measuring co-creation and for the comparability of co-creation studies (Aastvedt & Higdem, 2022). Thus, the first research question in this thesis was: How can co-creation be operationalised and measured in different public service innovation contexts?

The thesis argues that co-creation can be operationalised and measured by developing a clear conceptual understanding and by focusing on specific methods and activities. Work on the Co-VAL survey showed the importance of cognitive testing of the survey questions. Several questions that were initially included in the survey had to be changed or dropped, due to differences in understanding between respondents from different countries. This was also the reason that the term co-creation was not used in the survey. Instead of applying terms that represent complex concepts with blurry definitions, the survey focused on specific activities. This reduces the risk of misunderstandings and diverging interpretations of the questions and increases the comparability of the survey data in different contexts.

The existence of several, often conflicting, definitions of co-creation is a serious problem for measurement in surveys. Research of co-creation is also characterised by a lack of quantitative survey studies, which impacts researchers' ability to conduct comparative research and to generalise their findings. This thesis argues that in order to deal with the conceptual diversity in co-creation research it is necessary to develop operational, context-adapted definitions and indicators of co-creation, and shows how this is possible. Concepts of design thinking and co-creation can be measured in innovation surveys without using technical or specialised terminology, such as design thinking and co-creation. General questions can be used for surveying in several contexts, although the words used in specific questions may need to be adjusted to sectoral or regional contexts.

The diversity of research fields that have influenced the development of co-creation research in PSI has produced a variety of different understandings of what co-creation is. Despite different existing understandings of co-creation, collaboration between end-users, other relevant stakeholders and the provider through active participation in a joint problem- or task-solving and value-creation effort seems to be a common feature (see for instance Torfing et al. (2019); Voorberg et al. (2015)). This differentiates co-creation from broader terms such as user involvement. Co-creation is a form of user involvement that refers to active forms of participation. It is thus possible to distinguish user involvement methods as methods that require active participation (co-creation) and methods that aim at collecting or observing user needs and experiences without active participation (user-oriented methods) (see figure 7). The thesis therefore proposes a simple definition of co-creation that can serve as a starting point for the operationalisation and measurement of co-creation in innovation surveys.

Figure 7 User involvement and co-creation



Paper 1 illustrates the variety of methods, activities and processes that can be linked to co-creation and that are possible to include in survey questions. An overview of which co-creation- and user involvement methods have been included in the empirical analyses in this thesis is provided in figure 4, chapter 4.4.

Rather than including a definition of the concept in the questionnaire, co-creation intensity can be analysed by measuring the number of co-creation activities and methods used in public service innovation processes. Co-creation methods can be further distinguished in relation to innovation stages. Co-creation and other forms of user and stakeholder involvement can occur at all stages of the process. Co-creation during pre-ideation (research phase) has been assigned the term "co-initiation". Respectively, co-creation during ideation and development is also known as "co-design", while co-creation at the implementation stage can be understood as "co-implementation" (Voorberg et al., 2015). The first two terms (co-initiation and co-design) have been operationalised and applied in paper 3. However, a limitation of the Co-VAL survey is that they do not collect data on user involvement for each stage of the innovation process. The operationalisation of co-creation methods in relation to innovation stages therefore remains based on theory rather than on empirical data. Since such data is lacking, future survey design aimed at measuring co-creation in innovation should include questions about the stage of the innovation process. The thesis proposes how this could be achieved through suggested measures in paper 1.

In summary, co-creation as a concept in the context of this thesis is understood as a participatory, multi-actor process aimed at creating better public services. The underlying conceptual understanding is important for the development of surveys of co-creation, but the questions should not rely on the respondent's understanding of the concept. Instead, co-creation can be measured and assessed through focus on specific co-creation methods used in public service innovation processes. Co-creation methods are those methods that involve the active participation of different actors (such as users and non-governmental organisations) in a joint effort to define common problems and find solutions together.

2) What is the prevalence of co-creation in public service innovation?

As pointed out earlier, the existing literature on co-creation in public service innovation is mainly normative or based on few or single case studies. Thus, there is little data regarding the overall use of co-creation in public service innovation (Arundel et al., 2018; Voorberg et al., 2015). To shed light on the prevalence of co-creation in public service innovation

projects was one of the objectives of this thesis. Based on the aforementioned challenges in connection with co-creation it could be assumed that co-creation in the form of active participation can be more difficult to implement than methods that involve a lower degree of active participation (user-oriented methods).

Results from the main Co-VAL survey and the NGO pilot survey indicate a high degree of user and NGO involvement in public service innovation. Around 80% of the respondents in the Norwegian sample of 85 service innovation cases (main survey), and around 70% of the respondents in the Spanish sample of 94 service innovation cases (main survey) used at least one of four co-initiation and co-design related activities (with a mean of 1.8 methods for Norway and a mean of 1.4 methods for Spain). The low average numbers of co-creation methods used indicate, however, that service users are most often only involved at one stage of the innovation process. This suggests that co-creation is not a systematically integrated tool throughout the entire innovation process. The countries differ with regard to which co-creation method is the most used. The inclusion of users in brainstorming or idea generation workshops was the most reported co-creation related activity by Norwegian respondents (62%). In Spain, on the other hand, this was the least reported co-creation method. Instead, Spanish respondents revert mostly to one-on-one in-depth conversations with users to identify challenges or unmet needs (42%).

Furthermore, the most commonly used method of user involvement in both countries is still the non-participatory analysis of data on the experiences of users with previous or similar services, which was reported by over 64% of the Norwegian respondents and around 57% of the Spanish respondents. This indicates that the use of co-creation methods has moved beyond the initial stage of an experimental, pioneering initiative and is relatively widespread applicated. However, it is not yet applied as the *modus operandi* in public service innovation. The most common method to obtain input from service users is still the less challenging non-participatory collection and analysis of data on user experience.

Regarding differences in the use of co-creation at national and local government level, it was assumed that local municipalities have an advantage over national ministries or agencies when it comes to involving users in the innovation of services, because they more often provide services in close proximity to the user and should thus have better access to user feedback than public agencies or ministries (Torfing et al., 2019). However, the results revealed the exact opposite. Analysis of the Norwegian sample from the main Co-VAL

survey showed that there are significant differences in the use of user involvement methods between national and local levels of administration. Overall, respondents from national government organisations reported far greater use of methods to obtain input from users in service innovation, compared to respondents from local municipalities. This could be related to the availability of resources and competences for the orchestration and facilitation of co-creation activities (Torfing et al., 2019). National ministries and agencies are often bigger organisations than local municipalities and have more resources. This finding also shows that involving service users in public service innovation is a complex and multifaceted process that can be influenced by a variety of factors. Therefore, while proximity may be a contributing factor, it is not the only determinant of success.

Through the analysis of NGO participation in co-creation (Co-VAL pilot survey), we discovered that NGOs are actively engaging in co-creation activities with public organisations in order to improve the service experience for the user. 54% of the responding NGOs answered that they had provided assistance to government service innovation (paper 4). The most cited contribution methods for NGOs are participating in brainstorming, discussion groups or idea generation workshops; followed by providing information on the experiences of citizens or resident from similar services. Almost all, 97.6%, of respondents reported one or more of the contribution methods associated with user co-creation, with a mean of 2.6 co-creation activities. This indicates a high degree of co-creation in the contribution of NGOs to public service innovation. These contributions of the NGOs could be particularly important when it is a challenge to find sufficiently knowledgeable or motivated citizens (Schmidthuber, Piller, Bogers, & Hilgers, 2019; Strokosch et al., 2018, pp. 18-19).

3) **Under which conditions does co-creation occur and lead to positive outcomes of service innovation?**

On reviewing the literature, very little information was found on how the combination of different methods of user involvement, and different innovation methods and input factors to the innovation process affect the outcome of innovation. The third research question therefore asks: Under which conditions does co-creation occur and lead to positive outcomes of service innovation?

The results in papers 2 and 3 indicate that multiple conditions together can positively affect the outcomes of public service innovation. The majority of the configurations found in the investigated contexts included the involvement of users during innovation development. It can

thus be concluded that the involvement of service users is an important antecedent for successful service innovation development. The thesis investigates different forms and methods of user involvement, such as co-creation methods and user-oriented methods. User involvement in different forms can be associated with a high level of positive outcomes from public service innovation, as it occurs in most of the configurations that lead to high levels of positive effects on innovation outcomes. This includes both user-oriented, non-participatory methods and co-creation, which is defined as the participatory involvement of users or user representatives. One interesting finding is that the thesis does not find support for a direct positive relationship between co-creation and successful public service innovation across cases. None of the single input factors included in the analysis had a significant effect on the outcomes of service innovation by themselves. Only several input factors in conjunction lead to a high level of positive outcome effects, as demonstrated in the qualitative comparative analysis. This illustrates the complexity of succeeding with public service innovation.

The conditions that were found to appear in conjunction with co-creation methods are user-oriented methods/research of user experience (paper 2 and 3), as well as management support and employee engagement and a high degree of external collaboration (paper 3). In the case of Spain, demand from individuals as driver of the innovation was also a particularly important condition. The input of extra resources (funding and/or personnel) was of less importance than expected and appeared only in conjunction with high levels of user-oriented methods and low levels of participatory user involvement (paper 2). Neither could governmental funding be identified as an important driver of NGO participation in public innovation projects (paper 4). This suggests that the participation of NGOs in public service innovation projects and the positive effect of co-creation on outcomes of public service innovation does not depend on the input of additional resources or funding.

Paper 4 investigates the conditions under which co-creation of public service innovation with non-governmental organisations occurs and identifies several important conditions that appear in conjunction: Improving the user experience and community consensus of the innovation as the motivating reason for engaging actively in co-creation activities is the most often appearing condition (in 4 out of 5 configurations). For NGOs that do not have a high level of experience with developing service innovation themselves, “learning opportunities” are also a motivating reason to participate. This indicates that the public sector might contribute to innovation activity in NGOs that participate actively in public service innovation projects. However, the literature on the role of non-governmental organisations in public sector

innovation focuses exclusively on the transfer of knowledge from NGOs to public organisations. Thus, investigating the impact of co-created public service innovations on innovation activities in other organisations could be an interesting research opportunity.

4) **How might the co-creation of public service innovation be influenced by different administrative contexts?**

The thesis argues that the administrative tradition and culture of governance likely influence how co-creation of public service innovation occurs and shows this by theoretically connecting the comparative analysis in paper 3 to these contexts. Additionally, through paper 2, this thesis also investigates the effect of different administrative levels (national and local) on how co-creation occurs and impacts the outcome of public service innovation. However, the administrative level appears to be a less important context compared to the administrative tradition, even though small differences for local and national administrative levels in Norway were found. The overall pattern revealed more common features than differences between levels of government regarding configurations that lead to successful service innovation. Surprisingly, even though national government agencies report a far greater use of co-creation related activities than local municipalities, for most of the configurations that lead to high levels of positive results from service innovation the level of government does not matter. This implies that more is not always better, or that local municipalities could be better at utilising their resources. This has already been acknowledged by the Norwegian government and the Norwegian Association of Local and Regional Authorities (KS) who recently released a cooperation agreement on innovation and sustainable development in the public sector (KMD & KS, 2021). Placing the user at the core of public services requires collaboration and coordination across the entire public sector (KMD & KS, 2019). Thus, it is likely that in the process of this effort innovation methods will become more homogenous across different public organisations and levels of government. However, the findings also show that participatory user involvement (co-creation) is of less importance in two configurations for local government level. Cases that belong to these configurations include for, instance service, innovation in dementia care, or day care for young children. These examples illustrate how co-creation might not be suitable for all user groups. This could explain why co-creation practices are more prevalent at national government level that deals with vulnerable user groups to a lesser degree.

The findings in this thesis confirm and extend prior research (Voorberg et al., 2017) indicating that the existing system of governance and dominating administrative tradition is likely to have an impact on how co-creation is implemented. The thesis shows that the two countries have differing traditions for sharing authority and including stakeholders in public decision-making. Norway has a tradition of sharing authority and of civic engagement through a system of integrated participation in government by stakeholders, whereas Spain's administrative tradition is characterised by a high degree of centralisation and top-down decision making. With such different starting points, approaches to co-creation are likely to differ between the countries. Countries that do have an existing tradition of including citizens and other stakeholders in their decision-making processes may have an advantage over countries that do not have that tradition, when it comes to making good use of co-creation methods in public service innovation. By comparing successful paths to co-creating public service innovation in Norway and Spain, the thesis confirms country-specific differences in approaches to co-creation that lead to positive innovation outcomes, and argues that these differences can be connected to the country's existing tradition of public participation.

However, the thesis also found that even countries that lack a tradition of collaboration and citizen participation in public administration and governance can find ways to create successful public service innovations with citizens and other service users. The pathways for success, however, are likely to differ. This implies that approaches to user involvement in public innovation are more likely to succeed when they are adapted to the context of governance tradition. There is no "one size fits all" approach to co-creation. Hence, co-creation experience and knowledge may not be automatically transferred from one country to another.

Through Paper 4, this thesis investigates the co-creation of public service innovation in a third sector context and finds that a substantive number of the NGOs in the sample engage in the co-creation of public service innovations. This could indicate that the relationship between non-governmental organisations and public organisations has in fact been changing from a contractor role to a co-creator role as it has been suggested in the new public governance literature.

5) Summary and conclusions

This thesis provides an alternative approach to the dominantly normative literature on public co-creation research. Instead of looking at co-creation as a magical solution (Torfing,

Sørensen, & Breimo, 2022) to public service innovation I have investigated how the concept can be operationalised and to what degree it is in use and also under which conditions it is likely to have a positive effect on service innovation outcomes. I have also discussed how different contexts might influence the former.

Co-creation is a complex concept that has been defined in multiple ways. As a solution to this conceptual diversity, this thesis proposes to focus on the operationalisation of the concept by breaking it down into specific user involvement methods and activities that can be linked to, for instance, the degree and intensity of participation or the stage of the innovation process. This enables the measurement of co-creation without depending on the respondents' understanding of the concept and allows for the exploration of different user involvement methods under the same conceptual umbrella.

Such measurement is an important prerequisite for understanding the importance of co-creation in public sector innovation contexts and for developing relevant strategies for the successful application of co-creation. Rather than arguing for co-creation to be the new and better solution to modern challenges in public service provision, I have investigated what practices are in existence and under which conditions these practices succeed in improving public services. The thesis finds that a high degree of participatory user involvement might not always be the solution and that approaches to co-creation with service users varies between countries and levels of administration. It is also likely that there are other relevant contexts, such as the policy area (Røiseland, 2023), that will have an impact on which co-creation practices are the most appropriate.

Furthermore, the co-creation of public service innovation with individual service users can be challenging due to difficulties in finding relevant and willing participants, or in situations where vulnerable service users are unable to participate due to illness or disabilities, for instance in the case of health and welfare services (Andreassen, 2008; Skarli, 2021). This was also illustrated in the findings of this thesis in relation to paper 2. In these situations, non-governmental organisations (NGOs) can play a role in substituting for individual user input through the representation of user needs or by helping to find relevant participants. The findings in this thesis indeed suggest a high degree of NGO engagement in the co-creation of government service innovation projects, based on a motivation to increase the service experience for the service user. This finding indicates that NGOs are possibly an overlooked actor in co-creation research that mainly focuses on citizen involvement.

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7. OVERALL CONTRIBUTION AND IMPLICATIONS

This chapter presents the empirical, conceptual and methodological contributions of this thesis and points to the practical implications.

The thesis' main contribution is to add to the empirical foundation for co-creation research which has been considered to be lacking comparative studies that enable a higher degree of generalisation than the predominantly case-based studies in the field. The thesis thereby contributes to the empirical evidence base for the use of co-creation in public service innovation and the conditions under which co-creation positively affects the outcomes of service innovation in different contexts. This knowledge is important in order to implement co-creation successfully. In addition, the thesis also contributes to our knowledge of the role of NGOs in public service innovation and their motivations to participate in co-creation activities with public organisations. Through the application of qualitative comparative analysis, the thesis answers the call for comparative studies that cross countries and sectors in order to be able to analyse the effects of various inputs and combinations of inputs to innovation in the public sector.

Furthermore, in order to investigate co-creation empirically, conceptual clarification and operationalisation are needed. The thesis thus also contributes to the understanding of co-creation as a concept by developing and applying operational measures of co-creation. Another theoretical contribution of the thesis lies in obtaining a better understanding of the configurations of conditions that lead to improved public services as outcomes of the innovation as well as to the participation of NGOs in the co-creation of public service innovation. The configurational approach enables us to integrate different perspectives and aspects of public service innovation processes and helps to capture the complexity of the process which leads to new insights about the interplay of different factors.

In extension of this, the dissertation also contributes methodologically to current research on co-creation in public service innovation. The high number of different aspects that have to be

considered in studying collaborative public innovation makes it difficult to achieve comparable studies using conventional quantitative techniques. Understanding and measuring co-creation in public innovation in a way that enables comparability across different contexts remains a challenge. However, this thesis argues that qualitative comparative analysis and the combination of qualitative and quantitative methods is a possible way forward from this dilemma. QCA allows for the qualitative comparative analysis of a larger number of cases than traditional qualitative research and thereby enables cautious generalisations in relation to similar cases. To strengthen the evidence, QCA can be further combined with quantitative analysis and qualitative in-depth case studies.

The knowledge that was generated in the course of this thesis can be used by innovation researcher and survey designers regarding the measurement of co-creation activities in innovation contexts. The public sector is a comprehensive and complex field of study which presents a challenge to quantitative research. One of the insights gained from working with the Co-VAL surveys is that survey design for studying co-creation of innovation in the public sector should account for several different relevant contexts, such as the state- and governance tradition, the organizational type, the policy area and the size of the organisation, as well as the type of innovation. In other words, in order to enable generalisation from statistical analyses of cause-effect relationships, the survey should facilitate the collection of sufficiently large sub-samples for all the contexts mentioned. This was not the case with the Co-VAL surveys which limited the opportunities for quantitative analysis.

Politicians and public officials can make use of the insights regarding routes to successful public service innovation in the planning and facilitation of co-creation activities in their innovation processes. On the basis of this research, co-creating public service innovation may be planned and facilitated more successfully and efficiently. Since the findings are based on a broad variety of public service innovation cases that cover different sectors, and a variety of possible pathways to successful service innovation were discovered in the studies, public managers may choose and apply those combinations of methods they judge to best fit their given context. And finally, insights from this thesis may also be used to develop policies aimed at fostering NGO engagement in public service innovation.

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8. LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

There are several limitations to this research that should be acknowledged: First, all data, including data on outcome variables, is based on self-reports by managers, rather than independent sources. This could make the studies vulnerable to biased responses from respondents concerning the positive outcomes of innovation. Variation in the number of types of positive outcome is observable, however, which indicates that a potential positive bias is randomly distributed among the respondents. Some of the innovations reported by public managers were evaluated with users after implementation, which should provide far better information about the effect on user experience of the new or improved service. This implies that since not all of the innovations were evaluated with users after implementation, information about the effects on innovation outcomes is unevenly distributed among the respondents.

Secondly, in order to reach a deeper understanding of the subject, knowledge derived from quantitative analysis should be integrated with qualitative research. QCA is an exploratory method that produces indications of which configurations of co-creative innovation configurations are associated with high levels of positive effects on service innovation outcomes in a given context. To reach a deeper understanding of the underlying processes, more qualitative research is needed. For instance, a possible way of following up the findings from this thesis could be through in-depth interviews with public innovation managers who have experience with one or several of the co-creation methods mentioned in the survey and user experiences of the implemented service innovation could be assessed by questioning users directly.

Thirdly, the findings regarding the effects of co-creation use on service innovation outcomes are limited to four service-related outcome categories. The multifaceted nature of public value co-creation, however, extends beyond the improvement of public services (Agger, Tortzen, &

Rosenberg, 2018). Future research should not only focus on service innovation and service outcomes, but also include the effect of co-creation on other types of innovation, such as process innovation or social innovation. Furthermore, other contexts and factors than those included in this thesis could influence the effect of co-creation activities on the outcome of public service innovation. For instance, the importance of the policy field (e.g., education or health care), or the influence of leadership styles and the political sphere, are other contexts that should be further explored. In addition to co-creation with service users and civil organisations, the degree, form and effect of collaboration with the private sector in the development of public service innovation also should be investigated.

Finally, generalisation of the findings outside the contexts studied in this thesis should be approached with caution. In order to establish an evidence-based foundation of co-creation in public service innovation, more quantitative and comparative research on the relationship between collaborative methods and innovation outcomes is needed. Despite these limitations, this thesis is an important supplement to the dominantly normative and case-oriented co-creation literature.

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APPENDIX: DISSERTATION PUBLICATIONS

Appendix 1: Paper 1

Appendix 2: Paper 2

Appendix 3: Paper 3

Appendix 4: Paper 4

1

18: Measuring the use of design thinking and co-creation for innovation

Anne Jørgensen Nordli and Stefanie Gesierich

1. INTRODUCTION

Knowledge of innovation is continuously evolving. In the past two decades, interest in methods to involve users in developing innovations to improve value creation for consumers and users has grown (Vargo and Lusch, 2004; 2007). The application of design thinking and the use of co-creation in innovation projects are two methodologies for improving value creation. Co-creation involves the interactive involvement of relevant stakeholders, such as users and customers, in developing an innovation (Loureiro *et al.* 2020). Design thinking is a methodology that designers use to identify needs, frame problems, generate ideas, develop prototypes and test solutions (Brown, 2008), and often emphasises user-centredness and involvement (Micheli *et al*. 2019). Sometimes, co-creation and design thinking are integrated and referred to as co-design or co-designing with users (Sanders and Stappers, 2008).

Both design thinking and co-creation are relevant to processes, goods and service innovations in a range of sectors, but are considered to be particularly important to services. Design and the measurement of design have been used in manufacturing sectors for years (Galindo-Rueda and Millot, 2015; Roper *et al.* 2016), but design thinking, as a systematic methodology for handling the design process, has in the last decade proven to be useful and adaptable to services. That is probably because it is well suited for collaborative and cross-disciplinary approaches to innovation (Stickdorn *et al.* 2018) that are relevant to the interactive processes used to develop service innovations (Fuglsang, 2008; Sundbo and Gallouj, 2000). Co-creation has become a central issue in service research since it was identified as a key concept in the service-dominant logic framework developed by the marketing academics Vargo and Lusch (2007). The service-dominant logic is a framework that focuses on the user's co-creation of value and during the consumption of a service, which requires the integration of the resources (such as knowledge, skills, or information) of all participating actors (including users). Design and design actions and methods play a key role in enabling and facilitating actors' resource integration (Wetter-Edman *et al.* 2014).

The increase in the use of design thinking and co-creation methods in both the private and public sectors has led to several qualitative studies to increase our understanding of their role in innovation. However, the literature identifies several areas where more research is needed. First, the prevalence of co-creation and design thinking practices, and the effect of co-creation and design thinking on innovation outcomes in the public sector, need further investigation (Krogh *et al.* 2020; Torfing *et al.* 2019; Voorberg *et al.* 2015). Next, there is a call for comparisons of the co-creation of goods and services in terms of methods, tools and capabilities (Gemser and Perks, 2015) and research on the conditions under which co-creation leads to successful innovations, such as the stages of the innovation process and the degree

and way in which stakeholders are involved at the different stages (Gemser and Perks, 2015; Voorberg et al. 2015). Furthermore, knowledge on the costs of facilitating co-creation activities and potential negative effects is limited (Gebauer *et al.* 2013; Gemser and Perks, 2015). Quantitative studies based on surveys could help to advance research on these topics (Gemser and Perks, 2015; Krogh *et al*. 2020), since this method allows generalisation to a larger degree than qualitative studies and investigations of the relationships between different factors. To facilitate this, appropriate scales for measuring design thinking and co-creation need to be developed (Loureiro *et al*. 2020).

Yet survey measurement of both activities is still at an early stage. Since 1992, Community Innovation Surveys (CIS) have been conducted by national statistics offices in all European countries, based on guidelines in the Oslo Manual. The most recent edition of the Oslo Manual points to the need to measure design activities to develop a new or modified function, form or appearance for goods, services or processes, including business processes to be used by the firm itself (OECD/Eurostat, 2018). Common features of product design activities include involving potential users in the design process, i.e co-creation (through, for example, surveys of potential users, ethnographic research, co-creation, or project user groups, pilot testing on a sample of potential users, and post-implementation studies to identify or solve problems with a particular design). Such methods are referred to as design thinking methods, which is a systematic methodology for handling design processes and development/innovation processes (OECD/Eurostat, 2018). It should be mentioned that research has been done on how to measure design and its role in innovation (Galindo-Rueda and Millot, 2015; Roper *et al*. 2016). However, these works focus on design and not specifically design thinking.

Only a few innovation surveys have so far included questions on the use of co-creation or design thinking because these concepts were not covered in the first, second or third editions of the Oslo Manual. However, section 5.5.2 of the fourth edition (OECD/Eurostat, 2018) now argues for the importance of their measurement since they can support the innovation activities of both service and manufacturing firms. One effect is the inclusion of a question on co-creation in the 2018 CIS. Due to the nature of design thinking as a working process that focuses on separate stages of a development process, this chapter also seeks to suggest measures that enable data to be obtained for separate stages of the process.

To be able to measure innovation activities and concepts, they must be defined (Gault, 2018). The existence of several, often conflicting, definitions of both design thinking and co-creation is a serious problem for measurement in surveys. For example, Galindo-Rueda and Millot (2015) refer to huge challenges with creating reliable measures on design, since respondents view design in different ways. The same issues apply to design thinking and co-creation. Therefore, one of the main goals of this chapter is to suggest how the use of design thinking and co-creation can be measured in innovation surveys without using the words "design", "design thinking" or "co-creation" in the questions to avoid basing measurement on the respondents' own interpretation of these concepts. Furthermore, existing definitions are often academic and unsuitable for a survey. The chapter addresses how and why the concepts relate to innovation, how the two concepts relate to each other, and how far the work on developing indicators of design thinking and co-creation has come. A final goal for the chapter is to provide an operational definition for the two concepts and suggest measures that can be used in surveys by academics or national statistical agencies, or by academics in case studies. The development of proposed measures draws on a selection of innovation surveys from the public and private sectors that have explored the measurement of design thinking and co-creation in one or more questions: the Innobarometer 2010, the MEPIN survey, CIS 2020, the MAPSI survey, the Co-VAL survey, the Danish CIS 2010/2012 survey, and a private sector survey (Nakata and Hwang, 2020). In addition, we draw on our personal

experience with the development, testing, implementation, and analysis of the Co-VAL survey. The Oslo Manual also guided work on this chapter.

The chapter is structured as follows: the first two sections cover design thinking and co-creation separately, give an overview of theoretical definitions, and propose operational definitions that are suitable for surveys. The third section discusses how co-creation and design thinking relate to different stages of the innovation process, and argues that being able to differentiate between innovation stages is relevant when measuring design thinking and co-creation. The fourth section address contextual issues while the fifth section reviews initial survey research that included questions on design thinking or co-creation, and includes examples of those questions, as well as relevant supplementary information that can be obtained from a survey. Finally, the discussion in the last section provides suggestions for measurement, as summarised in Table 4.

2. DESIGN THINKING

The concepts of design thinking are rooted in how designers think and work. It can be defined as a design-based approach to solving human problems and is increasingly used for innovation (Nakata and Hwang, 2020). In the early years of its use, design thinking was often linked to the design of buildings or other aesthetic expressions. Herbert (1969) was among the first to refer to design thinking, followed by Rowe (1987) in his book titled "*Design Thinking*". Rowe (1987) describes detailed processes of design thinking and design work in practice, using three case studies of the use of design thinking for making an urban place in a large American city, building a new hotel, and designing and developing parts of Chicago. All cases involve developing and implementing something new, illustrating the proximity of design thinking to innovation (Lockwood, 2010; Nakata and Hwang, 2020), and provide a novel approach to innovation and problem solving (Micheli et al. 2019). The early years in the evolution of the design thinking concept (1960-1990), including the work of Rowe (1987) and Herbert (1969), may be referred to as a *design discourse (*Hassi and Laakso, 2011*)*, followed by a *management discourse* that expanded the concept into new areas, such as strategy, services and organisational design (Brown, 2008; Dunne and Martin, 2006). Additionally, design thinking is discussed as a useful approach for developing services, as in the concept of service design (Stickdorn *et al*. 2018). In the last decade, design thinking has also been adapted to the public sector context (Bason, 2017).

The design thinking methodology has spread to a range of industries, often providing a useful tool to solve problems or develop/improve goods as well as services. For example, Dorst (2011) gives an example of how a local government can use design thinking to solve problems such as drunkenness, fights, drug dealing etc. in a entertainment/bar quarter in a metropolis. Rau *et al.* (2017) show how a local gas supplier used design thinking to redesign its services to be more valuable for its customers and Ranger and Mantzavinou (2018) describe a case study on the application of design thinking to developing engineering education. Key elements of the design thinking process in these publications include a thorough investigation of the problem (obtain a bigger picture of the situation), the use of collaborative working methods, and testing of prototypes.

Micheli *et al.* (2019) conducted a systematic review and synthesis of the literature on design thinking and presen the three most cited definitions. First, Brown (2008) defines design thinking as "a discipline that uses the designer's sensibility and methods to match people's needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity". Micheli *et al.* (2019) argue that this definition qualifies design thinking as both a process ("methods") and an individual-level characteristic ("sensibility"). Second, Martin (2009) emphasises the thinking element,

defining design thinking as "the productive mix of analytical thinking and intuitive thinking" (Micheli *et al.* 2019). Third, Lockwood (2010) defines design thinking as "a human-centred innovation process that emphasizes observation, collaboration, fast learning, visualization of ideas, rapid concept prototyping, and concurrent business analysis". This definition focuses on the work processes and concrete methods used in design thinking. These three definitions encompass ways of thinking (mindset orientation) and use of methods (action-oriented perspectives) that provide a multiplex view of design thinking (Nakata and Hwang, 2020). An organisational mindset may encompass human centredness, abductive reasoning, and learning by failing (Nakata and Hwang, 2020). In addition to these three broad definitions of design thinking, the literature points to multiple principal attributes or themes: creativity and innovation, a user-centred focus and involvement of users, problem-solving and problem framing, iteration and experimentation, and interdisciplinary collaboration (Carlgren *et al.* 2016; Micheli *et al.* 2019).

User-or human-centredness is frequently noted as a fundamental feature of design thinking (Brown, 2009; Martin, 2011; Micheli *et al.* 2019). Bason and Austin (2021) refer to design thinking as representing a human-centred model of public governance. Some perspectives equate user-centredness with direct consumer input into value creation and innovation, often referred to as participatory or co-creative design (Micheli *et al.* 2019). These emphasise that end-users should have "influence and room for initiative in roles where they provide expertise and participate in informing, ideating, and conceptualising activities in the early design phases" (Sanders and Stappers, 2008). However, user needs can be taken into account in a variety of ways that do not necessarily entail direct user involvement (Beverland *et al.* 2015; Micheli *et al.* 2019).

Because of the range of design thinking definitions (Micheli *et al.* 2019), the complexity of the concept (multiple principle attributes,) and differences in perspectives (a team-based approach, a discipline, a way of thinking or a development process), measuring design thinking is difficult. Also, different respondents could have different interpretations of these terms, whilst other respondents may be unfamiliar with the terms and not understand them, e.g. as Galindo-Rueda and Millot (2015) note for design. That is why we suggest that the term "design thinking" should not be used in a questionnaire. To confuse matters, there are also several design thinking methodologies with similar aims, and design thinking methods can also be used without adopting a systematic design thinking methodology (OECD/Eurostat, 2018). We argue that one way of operationalising the definitions into something measurable is to focus on specific design thinking actions while acknowledging design thinking as a process. The suggested operational definition of design thinking is as follows:

> "A human-centred, collaborative and iterative process that encompasses research, ideation and development stages, and that uses methods to draw on user experience with the goal of improvement and innovation."

This definition captures the two elements from theoretical definitions: design thinking as a process, and the use of design methods and techniques. Thus, one of the main goals of the chapter involves clarifying which methods are defined as design thinking methods. In the section "Stages of the innovation process, the design process and co-creation", design methods will be further explained. Moreover, the element of human-centredness is covered in the next section on co-creation as an important element of design thinking. Based on the operational definition, one way of measuring design thinking is to ask respondents if their organisation uses specific working methods, tools or techniques that are commonly used as part of design thinking activities (OECD/Eurostat, 2018). This approach could also be used to

identify the intensity of use of design thinking or the use of a subset of design thinking activities.

3. CO-CREATION

Co-creation occurs when the innovation process involves an interactive relationship between the innovator, the intended users of an innovation, and possibly other external actors (Frow, Nenonen, Payne, and Storbacka, 2015; Piller, Ihl, and Vossen, 2010). The objective is to access external information from users and stakeholders in order to reduce uncertainties about the necessary characteristics of an innovation and possible solutions. The literature on co-creation mostly agrees that co-creation presumes a more active relationship among actors – going beyond traditional ways of collecting information on users such as customer surveys. However, co-creation theory is characterised by a lack of conceptual clarity concerning the definition of co-creation and the difference to other related concepts such as co-production or co-design (Frow et al. 2015; Jukić, Pevcin, Benčina, Decman, and Vrbek, 2019). In addition, there is a lack of empirical research on the degrees of user participation in innovation processes, e.g. highly participatory methods as well as low or non-participatory methods. Therefore, survey questions should be designed in a way that makes it possible to identify the different co-creation methods, activities and degrees of participation that are used throughout the innovation process.

In this chapter, we follow Voorberg et al.'s (2015) definition of co-creation as "the active involvement of end-users in various stages of the innovation process". However, since other parts of the theory suggest that co-creation can have lower degrees of active participation (Osborne, Radnor, and Strokosch, 2016), we suggest the following operational definition for co-creation:

> *"The participation of users and stakeholders in various stages of the innovation process."*

Early studies relevant to the concept of co-creation focused on lead users as innovators (Von Hippel, 2001, 2005). Related concepts include open innovation (Chesbrough, 2003) and crowdsourcing (Howe, 2009). Co-creation can be viewed as a particular form of open innovation where users participate actively in the development of an innovation (Frow *et al*. 2015; Piller *et al.* 2010). The idea is that involving end-users and other relevant stakeholders widens the knowledge base and brings new perspectives into the innovation process, resulting in better innovation outcomes (Ramaswamy and Gouillart, 2010, p. 71).

Originally developed in the private sector, the concept of co-creation has been adapted to public sector innovation (Alves, 2013; Brandsen *et al.* 2018; Farr, 2013; Osborne *et al*. 2016; Torfing *et al*. 2019; Voorberg *et al.* 2014). However, in contrast to the traditional focus of public participation on democratic representation and empowerment (Lund, 2018), co-creation focuses on the inclusion of diverse forms of knowledge to create innovative solutions to complex problems (Alves, 2013; Brandsen *et al*. 2018; Farr, 2013; Frow *et al*. 2015; Jukić *et al*., 2019; Osborne *et al*. 2016; Piller *et al*. 2010; Torfing *et al*. 2019; Voorberg *et al*. 2014).

Co-creation is often an integral part of design thinking, which recognises that user requirements cannot be clearly known ex-ante but can only be truly understood through an iterative process that includes pre-ideation research, ideation, development and post-implementation research (Arundel *et al*., 2018; Bason, 2018). Each stage of the design process may involve co-creation with users; however, user centredness can also be addressed, for example, through survey research on user needs or experiences. In other words, co-creation methods may also be used without applying the full design thinking framework and

not all elements of a design thinking framework include co-creation. Design thinking should be understood as a framework for innovation which involves the use of different design techniques and methods that often will, but not necessarily have to, involve co-creation with users and stakeholders. A typical co-creation technique is co-creative workshops, in which participants co-create personas and journey maps, generate ideas as well as designs, test prototypes, and select solutions together (Stickdorn *et al*. 2018).

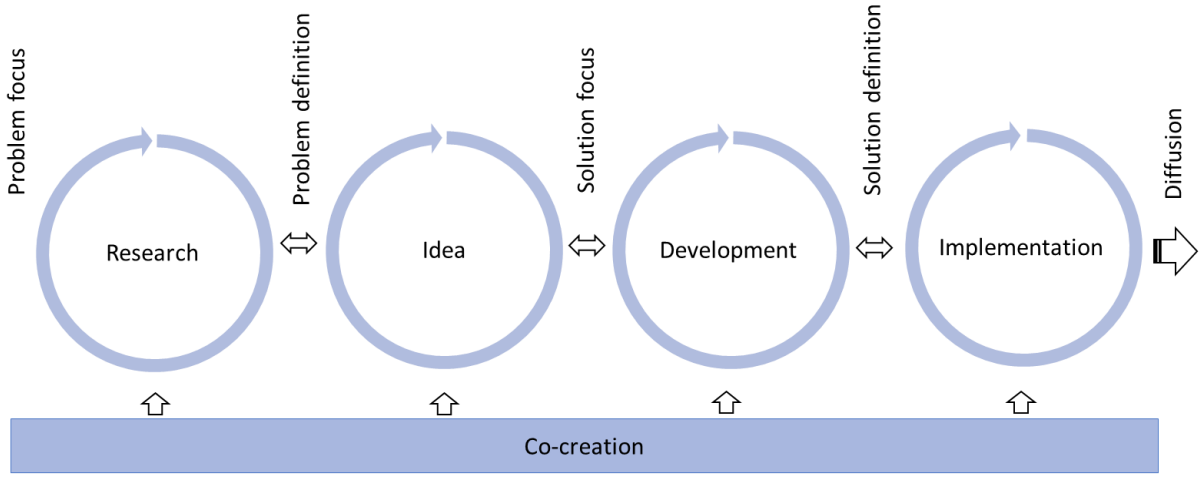
Opening up the innovation process through participatory design techniques such as co-creation adds new types of knowledge and helps in the understanding of the actual reality of those that might profit from the innovation (Bason, 2018). The idea of active user involvement through "participatory design" is based on the assumption that the creation of usable services, spaces or products will benefit from the involvement of the people who are going to use them (Ind and Coates, 2013). Participatory design techniques and methods encourage users and other stakeholders to contribute their own experiences and ideas by using a collaborative team approach that allows non-designers to become members of the design team, i.e. facilitating co-creation (Sanders and Stappers, 2008; Trischler *et al.* 2019). Participative practices do not have to be limited to the individual "lead-user" (Von Hippel, 2005), but should also involve average users or different kinds of stakeholder groups (Ind and Coates, 2013).

The identification of relevant participants depends on the type of innovation.Co-creation doesn't always have to involve users outside the organisation. For instance, the end-users of organisational process innovations, including new production processes, work routines or management philosophy (Høyrup, 2010), comprise employees within the organisation. Furthermore, the engagement of both internal and external users can take many forms, from face-to-face meetings involving a handful of people to web-enabled, large-scale social interactions, involving many thousands (Ramaswamy and Gouillart, 2010).

4. STAGES OF THE INNOVATION PROCESS: THE ROLE OF DESIGN THINKING AND CO-CREATION

Innovation activities are commonly viewed in terms of stages or phases, although the number of phases and their description may vary (e.g. Hartley, 2013; Rogers, 2003; Tidd and Bessant, 2013). Even though the non-linearity of the innovation process is widely accepted among innovation scholars (Alam and Perry, 2002; Bason, 2018; Cooper *et al.* 2002; Tohidi and Jabbari, 2012), the main focus of innovation research and innovation measurement (as, for instance, in the Community Innovation Survey), has been directed at the part of the process that is concerned with turning ideas or inventions into market-ready innovations and how to distribute those innovations, i.e. an idea stage, a development stage and an implementation stage. In contrast, innovation research seldom examined what happens before the ideation stage. In comparison, design thinking has a strong tradition of acknowledging the importance of understanding the problem or the need of the customer/user prior to ideation and solution finding (Brenner *et al.* 2016). Adding this important pre-stage to the three main stages of innovation (ideation, development and implementation), produces a simple model for innovation activities that better corresponds to design thinking processes (see Figure 1). As shown at the bottom of Figure 1, co-creation and other forms of user and stakeholder involvement can occur at all stages of the process.

Figure 1: Integrated model of design thinking, innovation process and co-creation



Source: The authors

Both the innovation process and design thinking process consist of reoccurring, iterative stages; however, the acknowledgement of the need to understand problems prior to an ideation stage could be valuable to the innovation process (see Figure 1).

The systematic literature review by Micheli et al. (2019) identifies eight useful tools and methods that can be applied to the innovation/design thinking process: ethnographic research, personas, journey maps, brainstorming, mind maps, visualisation, prototyping, and experimentation. Ethnographic methods focus on how individuals use products or processes, and include direct observation, interviewing and the use of informant diaries (Beckman and Barry, 2007; Micheli et al., 2019). Personas are symbolic representations of typical users – archetypes that represent user patterns and that are often created before journey maps that track and describe the experiences of a customer or user (Dalton and Kahute, 2016; Micheli et al., 2019). Brainstorming and mind maps are often used in the ideation stage. Brainstorming is a collaborative process that promotes "the search for new solutions that might not be possible through individual ideation" (Seidel and Fixson, 2013). Mind maps are collaborative sense-making techniques that "facilitate team-based processes for drawing insights from ethnographic data and create a common mind across team members" (Liedtka, 2015). Experimentation and testing include field experiments, prototyping and visualisation techniques such as drawing and picturing that can enable continuous learning (Dalsgaard, 2014; Micheli et al., 2019). Storytelling, a form of visualisation, can enhance imaginative abilities (Carlgren et al., 2016; Micheli et al., 2019) and guide decision-makers in the design thinking process. Trischler and Scott (2016) address how personas, visualisation and observational techniques also represent complementary methods for designing public innovations.

In Table 1, we map the eight methods of design thinking across each of the four innovation process stages. The pre-ideation research stage can include data collection on user experiences, direct observation of user experiences, or interviews with users and other relevant stakeholders (co-initiating). Co-creation workshops, brainstorming sessions and journey mapping are typical tools that are applied during the ideation phase (co-design). Users and stakeholders can also be included in the development and testing of prototypes and solutions (co-implementation) (Røiseland, 2021; Voorberg et al., 2015). So far, there is little empirical research that confirms, or shows, in which stage each method is most commonly applied. This is a topic for future survey research.

Table 1: Design methods used in the different stages of the innovation process

Method	Research stage	Ideation stage	Development stage	Implementation stage
Research	X			
Personas	X			
Journey maps	X			
Brainstorming		X		
Mind maps		X		
Visualisation		X	X	
Prototyping			X	
Experimentation			X	X

Source: Authors

5. RESEARCH MEASURING DESIGN THINKING AND CO-CREATION

Table 2 summarizes several surveys that the authors were able to find and access that included questions on design thinking or co-creation. The table may be incomplete because there are no databases of all innovation surveys that would make systematic searches possible. Also, there are language challenges when it comes to accessing national versions of the CIS in all countries.

Table 2: Surveys with questions on design thinking or co-creation

Survey	Year	Coverage	Cognitive testing
MEPIN survey[1]	2009	Public sector units that are classified as enterprises	Pilot study
Innobarometer[2]	2010	Public agencies	No
Australian/New Zealand university survey[3]	2015/2016	Universities	Yes
MAPSI survey[4]	2018	Public sector innovation units	No
Co-VAL survey[5]	2019	Public sector managers (municipal and national level)	Yes
CIS-2020[6]	2018/2020	Businesses (manufacturing and service industries)	Yes
Nakata and Hwang Survey[7]	2020	Managers of innovation projects	Unknown
The Danish CIS[8]	2010 and 2012	Businesses (manufacturing and service industries)	Yes

Source: The authors

1. https://www.nordicinnovation.org/2011/measuring-public-innovation-nordic-countries-mepin
2. https://data.europa.eu/data/datasets/s881_305?locale=en
3. The full survey can be found in Arundel *et al*. (2016)
4. The survey is not publicly available, but a report on the results can be found in McGann, Lewis, and Blomkamp (2018)
5. https://www.co-val.eu/
6. https://ec.europa.eu/eurostat/web/microdata/community-innovation-survey
7. The survey is not publicly available, but an analysis of the results can be found in Nakata and Hwang (2020)

8. https://www.dst.dk/da/Statistik/emner/uddannelse-og-forskning/forskning-udvikling-og-innovation/innovation-og-patenter

Three surveys listed in Table 2 included only one or a few relevant questions: Innobarometer 2010, the MEPIN survey (Bloch, 2011) and the 2018/2020 CIS surveys. The Innobarometer 2010 survey has two questions addressing the involvement of users. The MEPIN survey asks whether the organisation cooperated on innovation with enterprises or citizens (as clients/users) and whether citizens/enterprises (as clients/users) are drivers of the organisation's innovation activity. The Community Innovation Survey (CIS-2018/2020) has one question addressing co-creation with users and a few on design thinking methods (CIS 2018). The final five surveys in Table 2 are examples of surveys with multiple questions on co-creation and/or design thinking. These surveys focus on specific design or co-creation methods used in the innovation process and include the Co-VAL survey on public administrations, the Australian/New Zealand university survey, the MAPSI survey, the Nakata-Hwong surveys of the private sector, and the Danish CIS-2010/2012. Of note, the CIS and similar surveys based on the Oslo Manual have, for years, included questions on collaboration, sources of idea for innovation, and who developed the innovation. However, these questions do not delve into how and to what degree users were involved or which methods were used.

The last column of Table 2 shows if the questions in each survey were cognitively tested. This is an important step for assessing the quality of questions on design thinking and co-creation to prevent misunderstandings across respondents in how concepts are understood and to ensure that a single questionnaire can be understood by all surveyed populations. Not only are there contextual differences between the private and the public sector, but respondents can also differ between countries due to national contexts of management styles and organisational cultures. Even in cases when respondents do understand the terminology, they may still interpret it differently based on their background information and knowledge (Collins, 2003).

As an example of the importance of cognitive testing, the Co-Val survey cognitively tested 18 questions in face-to-face interviews with 54 respondents from the target population in six countries. Only one question passed with no revisions. Five questions failed due to national differences in interpretation or because interviewees had difficulty understanding the question. Flawed or failed questions included those that were understood differently by various groups of respondents and those that elicited incomparable or inaccurate answers (Arundel et al., 2019). For example, one result showed that even a term such as "service design" was unclear to many interviewees.

Questions from all the surveys in Table 2 are presented in Table 3. Questions that were similar (referring to the same method), but with slight differences in wording have been listed together. The first part of Table 3 shows the more general survey questions on co-creation and design thinking, followed by questions that focus on specific co-creation and design thinking methods or activities, and finally questions that focus on capturing a design thinking mindset (Nakata and Hwangs Survey). Some surveys, such as the Co-VAL survey, ask questions about one specific innovation, i.e. the most important innovation (see Table 3). This has several advantages, which are addressed in Chapter 10 of the fourth version of the Oslo Manual. Moreover, Table 3 also provides information about which concept the question is relevant to and the relevant stage of the innovation and design process (referring to Figure 1 and Table 1). Some questions are relevant to both design thinking and co-creation, whilst others only capture design thinking or co-creation.

The reviewed surveys used two different response modes – yes/no and ordinal scales. The response options include whether specific methods have been used or not (The Co-VAL items), to what degree they are used (The MAPSI), and a Likert importance scale

(Innobarometer 2010, MEPIN). The Co-VAL questionnaire includes an additional question concerning the users of the innovation, with a list of possible users including government employees, individuals (citizens, residents, etc.), businesses or business associations, community groups or non-profit organisations, etc. Since the questions focus on the most important innovation and seek to categorise whether this innovation is a service or process innovation, respondents are instructed that the users of process innovations are usually employees while the users of service innovations (public services) can be citizens/individuals, government employees, businesses or community groups. The respondents are then asked to answer a question on the different types of users. This question can be useful for analysis and interpretation. Moreover, the Co-VAL survey asks questions about the use of methods linked to the stages of the innovation process (based on theory). Additionally, Co-Val asks whether the innovation had been evaluated and whether user experience of the innovation was included in the evaluation.

Table 3: Examples of survey questions on co-creation (CC) and/or design thinking (DT)

Question	Survey	Relevance
General questions related to CC and DT:		
How important were enterprises (as clients/users) and citizens (as users) as co-operation partners in your innovation activities?	MEPIN survey Danish CIS 2010/2012	CC
How important were citizens/enterprises (as clients/users) as a driving force for your innovation activity?	MEPIN survey	CC *
How important were clients/users as information sources for the development of innovation?	Innobarometer 2010	CC *
Are users involved in the design and/or planning of innovation/ new or improved services? (fully, partly, not at all)	Innobarometer 2010 Australia/NZ university survey	CC (co-design)
Did the user(s) have an active role in the creation of the idea, design and development of the product?	CIS-2018/2020	CC (co-design)
Did your work unit obtain assistance, advice, technology or other inputs from design firms, innovation labs or living labs?	Co-VAL survey	DT CC
Were the following methods used to develop your work unit's most important innovation?		
Analysis of existing (big) data (on the experience of users with previous or similar services or processes)	Co-VAL survey MAPSI survey	DT (research)
Conducting research to identify challenges	Co-VAL survey	DT (research)
Conducting research to identify different types of users	Co-VAL survey	DT (research)
Collecting first-hand data on customers to discover deep needs	Nakata & Hwang Survey	DT (research)
Seeking to discover new insights on customers through research	Nakata & Hwang Survey	DT (research)
Utilising various methods to make fresh discoveries about customers	Nakata & Hwang Survey	DT (research)

One-to-one in-depth conversation/ empathy conversations with users to identify challenges or unmet needs	Co-VAL survey MAPSI survey Danish CIS 2010/2012	DT (research) CC (co-initiating)
Project/focus groups with potential users of an innovation to identify challenges or unmet needs	Co-VAL survey MAPSI survey Australia/NZ university survey Danish CIS 2010/2012	DT (research) CC (co-initiating)
Survey research including users and stakeholders	Australia/NZ university survey, MAPSI survey, Danish CIS 2010/2012	DT (research)
Ethnographic methods, such as participant observation	MAPSI survey Danish CIS 2010/2012	DT (research)
Research literature/evidence/reviews/syntheses	MAPSI survey	DT (research)
Service mapping, systems thinking or (re)design	MAPSI survey	DT (ideation)
Inclusion of users/stakeholders in brainstorming or idea generation workshops, walkthroughs or other collaborative approaches	Co-VAL survey MAPSI survey	CC (co-initiating, co-design) DT (ideation)
Brainstorming or idea generation to identify solutions	Co-VAL survey Australia/NZ university survey Nakata & Hwang Survey CIS 2018	DT (ideation)
Design sprints and/or hackathons	MAPSI survey	DT (ideation)
Generating new concepts that challenge the assumptions of what works	Nakata & Hwang Survey	DT (ideation)
Arriving at fundamentally new concepts by reframing problems	Nakata & Hwang Survey	DT (ideation)
Asking questions to ideate new concepts	Nakata & Hwang Survey	DT (ideation)
Real-time studies of how users experience or use a prototype of the innovation	Co-VAL survey MAPSI survey Danish CIS 2010/2012	CC (co-implementing) DT (prototyping /testing)
Test the “ease of use” of a planned innovation on a sample of potential users/ Pilot testing of the innovation	Australia/NZ university survey Co-VAL survey	CC (co-implementing) DT (prototyping/ testing)
Randomised control trials or random assignment experiments	MAPSI survey	DT (prototyping/ testing)

Iteratively testing ideas to refine and launch new products or services	Nakata & Hwang Survey	DT (prototyping/ testing)
Repeatedly experimenting while developing new products or services	Nakata & Hwang Survey	DT (prototyping/ testing)
Adjusting new product or service ideas more than once based on customer feedback	Nakata & Hwang Survey	DT (prototyping/ testing) CC (co-implementing)
Training for how to use an innovation	Australia/NZ university survey	CC (co-implementing)
Assign a dedicated team/working group to develop or implement the innovation	Co-VAL survey Australia/NZ university survey CIS 2018	DT
Challenge prizes, awards and open innovation programmes	MAPSI survey	DT*
Agile or lean project management	MAPSI survey	DT*
Internet community feed back	Danish CIS 2010/2012	DT CC
Involvement of lead users in the process	Danish CIS 2010/2012	DT CC
To what extent is the following performed? (focus on mindset)		
Inviting mistakes in order to learn	Nakata & Hwang Survey	DT mindset (learning by failing)
Embracing failures because they lead to new insights	Nakata & Hwang Survey	DT mindset lLearning by failing)
Risking failure early and often	Nakata & Hwang Survey	DT mindset lLearning by failing)
Believing better solutions are found more quickly by permitting failure	Nakata & Hwang Survey	DT mindset (learning by failing)
Pushing the boundaries of possible product or service ideas in the private sector	Nakata & Hwang Survey	DT mindset (human-centredness)
Being more centred on the needs of the customer, not of the business	Nakata & Hwang Survey	DT mindset (human-centredness)
Maintaining the human perspective while solving customer problems	Nakata & Hwang Survey	DT mindset (human-centredness)
Understanding the context of customer needs, such as how the customer lives or works	Nakata & Hwang Survey	DT mindset (human-centredness)

* Opinions may differ in the literature as to whether the method falls under co-creation (CC) or /design thinking (DT), or if it is only weakly related to the concept.

Both the Co-VAL and the Australian/New Zealand university surveys include a question on the source of the idea for the most important innovation. The list of potential sources includes potential users (See section C.7a in the Co-VAL survey and section G2 in the Australian/New Zealand survey). A third survey – "Mapping Public Sector Innovation Units in Australia and New Zealand" (named MAPSI in this chapter) – also addresses methods used by public sector innovation units (McGann *et al*, 2018). This survey includes some of the same questions as the Co-VAL survey, such as user testing, prototyping, user workshops, interviewing and other research techniques. Moreover, the survey also includes questions on ethnographic methods, agile and lean project management, design sprints, hackathons, big data analysis and random control trials.

6. SUGGESTIONS FOR MEASUREMENT

Both design thinking and co-creation are complex concepts, with many definitions that make them challenging to operationalise and measure. The limited number of surveys to date have addressed the problem of multiple definitions by focusing on the use of methods and techniques associated with the concepts. In this section, we discuss measurement approaches summarized in Table 3 for design thinking, with a focus on surveys that delve more deeply than the MEPIN, CIS and Innobarometer surveys and make further comparisons with theory in order to identify possible limitations. Suggestions for measuring co-creation as a concept closely related to design thinking are also discussed. For instance, the proposal in section 1 of Table 4 starts by asking the respondents who they define as the user of their innovation(s). After that, a set of questions for measuring the use of design thinking is suggested (section 2 of Table 4).

The proposed questions in Table 4 could be included either in an innovation survey that covers all innovation activities or in a survey that includes questions on a single, most important innovation. However, the precise wording and formulation of the questions needs to be adapted accordingly.

The reviewed surveys show that questions can use several response modes. Some focus on whether specific methods have been used or not (Co-Val) or to what degree they have been used (MAPSI), whilst other questions ask for the importance of the methods. The decision on which response category to use should be based on how commonly these methods are expected to be used. If common, the response category should ask about the importance or degree of use, for example:

> How important was the use of this method? (scalar response options from no importance to high importance)

The suggested items in section 2 of Table 4 cover the most commonly-used design thinking methods without using technical vocabulary that some respondents may not understand. The suggested items are drawn from Table 3 (mostly from the Co-val and MAPSI questionnaires), but are evaluated based on theory and whether they have been cognitively-tested. We suggest two questions that were not included in the existing surveys summarized in Table 3. The first is a question on the use of visualisation techniques (question 6 in Table 4), since this is a key component of the design process. The second is question 10 on the iterative nature of the process (repeatedly experimenting and adjusting, based on feedback).

However, these two questions need to be cognitively-tested before implementation in a survey. In addition, we suggest a few minor changes. 'Observation' is added to question nine on real-time studies because observing user experiences is part of many real-time studies. Of note, the term 'ethnographic research' is not used, but this should be captured by the reference to real-time studies and observation. Lastly, prototyping and experimenting are included as separate questions.

It is important to underline that the suggested measures in Table 4 are based on only the most common and elementary methods in design thinking. The list in Table 3 is extensive and includes questions on design thinking methods, for example from the MAPSI survey, that were not cognitively tested. It is very likely that there will be different understandings or misunderstandings of technical vocabulary, such as ethnographic methods, agile and lean project management, design sprints, hackathons, big data analysis and random control trials. Therefore, we do not suggest using technical descriptions of these methods unless they undergo extensive cognitive testing that establishes that they are correctly understood by the target population of interest. An alternative is to include an open question to allow respondents to report methods that they feel do not fall under the other categories (see the end of question 3 of Table 4). Questions on the mindset of design thinking are not included in Table 4, as they may require more testing in semi-structured interviews followed by cognitive testing.

Co-creation with users can occur when using several of the design thinking methods. It would be useful for research to know when users are involved in specific methods. This could be done by asking, after a yes or no response category for each method, the question 'were users of this innovation / your innovations involved? (yes or no).

Since co-creation is an integral part of design thinking, we recommend that co-creation questions are also included if the goal is to measure design thinking. However, for surveys that are only interested in co-creation, an alternative is to formulate questions that specifically ask about user involvement, as in the Co-VAL survey.

Table 4: Suggested questions for measurement of design thinking and co-creation

1. Who are the users of the products/services you offer/for your most important innovation? (Tick all that apply)

Public sector:	**Private sector**:
- Government employees	- Employees
- Individuals (citizens, residents as main users)	- Customers
	- Owners of the business
- Individuals (citizens or residents who are the relatives of vulnerable citizens)	- Businesses or business associations
	- Community groups or non-profit organisations
- Businesses or business associations	- Other (please describe)
- Community groups or non-profit organisations	
- Other (please describe)	

2. Did your work unit use the any of the following methods to develop your most important innovation/to develop your innovations? (Tick all that apply)

1. Conducting research to identify different types of users
2. Analysis of data on the experiences of previous or similar services or processes
3. One-to-one in-depth conversations (interviews)
4. Focus groups (interviews)

5. Brainstorming or idea generation workshops
6. Visualisation, such as mind maps, drawings, sketches or other kinds of visual mapping/picturing
7. Development of a prototype
8. Pilot testing of the innovation
9. Real-time studies or observation of user experiences
10. Repeatedly experimenting while developing and adjusting ideas and prototypes more than once, based on feedback
11. Assign a dedicated team/working group
12. Other methods (please describe)

3. Were stakeholders other than the users involved in developing the most important innovation/involved in innovation activities? (Tick all that apply)

Public sector:	**Private sector**:
- Government employees	- Employees
- Individuals (citizens, residents)	- Customers
- Businesses or business associations	- Owners
	- Other businesses or business associations
- Community groups or non-profit organisations	- Community groups or non-profit organisations
- Other (please describe)	- Other (please describe)

Source: The authors

The set of items in Table 4 are relevant for the private sector as well as the public sector, but minor adjustments in wording may be required. For example, individuals as 'users' could be replaced by 'customers' as illustrated in question 1 of Table 4. Compared to the Co-VAL survey, we also added a new user alternative for the public sector for this question: "Individuals (citizens or residents who are the relatives of vulnerable citizens)", since "user involvement" in the case of services for vulnerable groups may require collaboration with relatives instead of the vulnerable user.

The Co-VAL questionnaire defines a "user" and limits questions on co-creation to users only. However, there may be stakeholders other than the users that can be involved in innovation activities. We suggest adding a question that asks whether other relevant stakeholders have been involved in their innovation activities (question 3 of table 4). The list of stakeholders is only an example – it may need to be adapted to the local context and research aims. An alternative is to capture stakeholder contributions in other questions of the survey, for example in a section on external knowledge sources to innovation.

Using the same multiple items for measuring design thinking and co-creation for the private and the public sector, or between countries, would be beneficial, since this allows for comparisons. It gives the opportunity to analyse differences in how design thinking and co-creation unfold in different contexts. Trischler and Scott (2016) address, for example, how personas, visualisation and observational techniques are prominent in the public sector, whilst other methods may be more central to the private sector. There may also be variation by industry within the private and public sectors.

Measuring user involvement by innovation stage

The Co-VAL questions capture many of the methods or techniques asked for in the other surveys summarized in Table 3. Since the Co-VAL questions were cognitively tested, we include all of them in Table 4. However, a serious limitation to the Co-VAL questions is that they do not unambiguously collect data on user involvement for each of the four stages of the innovation process (identifying the problems, finding ideas for solving the problems, developing an innovation to solve the problems, and implementing the innovation). The main headings of the Co-VAL questions refer to the development of the most important innovation, whilst some sub-questions under the heading refer to earlier stages of the innovation process, i.e. idea generation and identification of a solution. Design thinking theory refers to some methods as being more relevant to specific stages, such as prototyping for development and brainstorming for ideation, although little quantitative research confirms this. There is therefore a need to collect data and analyse data by each innovation stage. For example, if asking (as exemplified above): "Were focus group interviews used to identify challenges or unmet needs?" Such a question would not reveal whether a focus group had been used after testing a prototype (i.e. in a later stage of the innovation process, or only as part of identifying the problem). For this reason, there should be an opportunity to indicate at which stage a certain method is used. How to do this is illustrated in Table 5 for one of the questions from Table 4.

Table 5: Example of measuring the use of a co-creation method at different stages of the innovation process

How important was including users in brainstorming or idea generation workshops?
Very low
Low
Medium
High
Very high
Not relevant

If low to very high) In which stages of the innovation process were users involved in brainstorming or idea generation workshops? (Tick all relevant stages):

1. Identify the problem
2. Generate ideas for problem solving
3. Develop the innovation
4. Implement the innovation

Source: The authors

Cognitive testing of the Co-VAL questions used a matrix format to ask interviewees about the involvement of users at specific stages. This question failed since many interviewees did not recognise the proposed stages, although another possible explanation is that the use of a matrix design confused the interviewees. This suggests that the format in Table 5 above could be more effective at eliciting good quality answers. In addition, the Co-Val matrix format was not a problem for Norwegian respondents, suggesting that there are country-specific differences that underline the importance of cognitive testing. If the cognitive testing of stages fails, an alternative is to combine the stage with each method of user involvement in the question (as done in the Co-VAL survey), e.g. "Were focus group interviews used to identify challenges or unmet needs?"

Measuring the degree/intensity of design thinking and co-creation

Design thinking is a human-centred, collaborative and iterative methodology for innovation that encompasses research, ideation and development stages and which draws on user experience. Asking about the use of methods that are commonly used as part of a design thinking methodology is one option for measurement. However, the use of just one or a few design methods does not meet the full definition, i.e. the company may not implement design thinking as a systematic methodology. For example, the Oslo Manual (OECD/Eurostat, 2018) recommends collecting data on the importance of using a design thinking methodology for innovation by asking questions that measure the degree or intensity of design thinking, using four categories:

- no design activity at all
- design is used to develop the aesthetic form or style of goods and services, but design activities are not conducted on a systematic basis
- design thinking methods are integrated into the product development process
- design is a key strategic element of the firm's business model.

Alternatively, in a measurement tool that seeks to avoid the need to define concepts in the questionnaire, the degree of design thinking and co-creation could be estimated by summing the number of methods used. For instance, if a respondent checked 'yes' or 'high importance' for all or most of the methods asked for in all or most of the innovation stages, then this would be an indication of a high degree of design thinking and/or co-creation. It could also be a criteria for full implementation that several methods plus user involvement should be present in all four stages of innovation development. On the other hand, if the respondent only checks one or a few design methods, this would indicate the lack of a systematic design thinking methodology.

Design thinking and co-creation as process innovations

Design thinking and co-creation methods are activities that often go hand in hand with developing or implementing innovation, which is why it is interesting to understand their role in innovation. In addition, the use of design thinking and co-creation could be innovations in their own right. For instance, the Oslo Manual (OECD/Eurostat (2018) defines business process innovation as a new or improved business process that differs significantly from the firm's previous business process and that has been brought into use by the firm. Therefore, if the use of design thinking and co-creation methods are new to the firm, they are a business process innovation for the firm. If the goal for measurement is to capture design thinking or co-creation as process innovations, an additional question can ask *if the use of any of the methods were new to the firm*, or if it is of interest at a more detailed level, asked for each method.

7. CONCLUSION

This chapter suggests how the concepts of design thinking and co creation can be measured in innovation surveys (Table 4) without using technical or specialised words such as design, design thinking and co-creation. The proposed questions capture activities and working methods of relevance to design thinking and co-creation that can be used by organisations to

develop and implement innovations, the use of these methods at specific stages of the innovation process (Table 5), and how to estimate if companies implement design thinking as a systematic methodology. Even though the suggested questions are general and can be used for surveying in several contexts, the words used in specific questions may need to be adjusted to sectoral or regional contexts. Finally, some of the proposed questions or response categories in Tables 4 and 5 have not been cognitively tested. Researchers who are interested in including untested questions on design thinking and co-creation in survey research are strongly recommended to cognitively test them.

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Investigating Effects of Co-creation on Outcomes of Public Service Innovation – A Comparative Analysis at the National and Local Government Level in Norway

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Abstract

Co-creation in public service innovation is a prominent research field, but few have empirically investigated its effect on the outcomes of innovation. This paper contributes with empirical-based knowledge on the effect of participatory user involvement and other user-oriented methods on public innovation outcomes in different contexts. By employing qualitative comparative analysis (QCA) based on a survey of innovation activities of Norwegian public administration agencies, this article identifies several configurations for local and national authorities that lead to successful service innovations. The main finding suggests a positive relationship between user input and positive effects on service outcomes. However, local and national government levels differ regarding the use of input factors and methods of user involvement. The study contributes to our understanding of the effect of co-creation in different contexts and provides insights into when and how co-creation with users is a useful tool in public service innovation.

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Introduction

Co-creation in recent years has transformed from being a loosely formulated idea to becoming a top-down-initiated innovation strategy, with particular prominence in the Scandinavian countries (Breimo & Røiseland, 2021; KMD, 2020; Torfing, Sørensen, & Røiseland, 2020). Furthermore, co-creation and collaborative innovation have been argued to be a new innovation paradigm in both the private and the public sector (Hartley, Sørensen, & Torfing, 2013; Venkatram Ramaswamy & Ozcan, 2014; Stoyan et al., 2011). Despite a lack of consensus regarding the concept's content (Jukić, Pevcin, Benčina, Decman, & Vrbek, 2019; Røiseland & Lo, 2019), it is common to characterise co-creation as the involvement of end-users and other relevant stakeholders in the development of innovation (Voorberg, Bekkers, & Tummers, 2015). Consequently, co-creation is by definition a process of collaboration (Sørensen & Torfing, 2011) in which service users and service providers form partnerships in order to jointly create a public innovation. This is also the understanding of co-creation applied in this study.

Co-creative innovation as a concept influences expectations concerning public service production and management. Public organizations are expected to align themselves in the direction of continuous, user-centred improvement and renewal (Holmen, 2020) by collaborating across organizational structures and different levels of government (KMD, 2020; KMD & KS, 2019). Researchers have pointed out that local governments are particularly pressured by a combination of rising expectations for service delivery and societal problem solving along with scarce public resources. Consequently, local governments have to turn to co-creation as a tool for enhancing innovation in order to make ends meet (Bentzen, Sørensen, & Torfing, 2020; Holmen, 2020; Holmen & Ringholm, 2019). It is therefore interesting to investigate whether municipal

services differ from state services regarding user involvement in innovation processes.

Even though co-creation is being advocated as the new innovation paradigm, we still have very little empirical data on the use of co-creation practices and the effect of co-creation on the outcome from innovation (Steen, Brandsen, & Verschuere, 2018; Verleye, 2015; Voorberg et al., 2015). Nonetheless, the overall literature on co-creation of public services is optimistic with respect to its presumed effects. Proponents claim that close collaboration between service providers and citizens provides opportunities not only for improving efficiency and quality of public services, but also for enhancing democratization and trust in government (Røiseland, 2016; Steen et al., 2018). Leading scholars agree that, so far, the research on co-creation in public services has been more focused on which factors influence the emergence of co-creation instead of assessing and measuring its impact (Callens, 2022; Torfing, Sørensen, & Røiseland, 2019), and there have been few quantitative studies that have tested the assumption of positive effects of co-creation on innovation (Krogh, Sørensen, & Torfing, 2020). In particular, more research is needed on conditions under which co-creation leads to successful innovations, for instance, the degree and the way in which stakeholders are involved (Krogh et al., 2020; Torfing, Sørensen, et al., 2020; Voorberg et al., 2015).

To address these research gaps, the article presents findings from a comparative analysis which identifies and examines configurations (combinations of input factors) that are linked to positive effects on four outcomes categories from service innovation, namely: service quality, user experience of the service, user access to information and safety of citizens and residents. Using data from a survey of public administration managers responsible for innovation projects in the Norwegian public sector, the study explores how the combinations of innovation input factors differ regarding the level of government (national and local). This is, to the author's knowledge, the first study of the effects of co-creation on innovation outcomes in the Scandinavian context that is based on configurational theory. Thus, the study contributes to further advance research on the linkages between co-creation and public sector innovation outcomes in different contexts, and the insights may provide guidance to policy makers as well as public sector officials.

The article continues to identify four input factors that can be associated with co-creation, namely the inclusion of user input through participatory and user-oriented methods, the degree of external assistance, and the use of design thinking during innovation development. The following section explains these four input factors and their connection to the concept of co-creation in more detail and formulates hypothesis related to the importance of these input factors at local and national government level respectively. Next, the methodological approach (QCA) and source of data is explained. Subsequently, results from the analysis are presented and discussed in light of the theoretical expectations. The conclusion summarizes the key findings of the study and provides insights into implications for managers and suggestions for future research.

Co-Creation and Public Service Innovation

The concept of co-creation emerged originally in the private sector as a strategy for enhancing production and value creation in businesses (Prahalad & Ramaswamy, 2004a, 2004b), but it has also been recognized as a useful approach in the context of the public sector that primarily produces services through processes in which service users play a central role (Agger & Lund, 2017; Bentzen et al., 2020; Farr, 2013, 2016). Even though citizen participation has a strong tradition in the Scandinavian welfare states, cooperation with users of public services was traditionally based on rules and rights, which largely allowed for the use of professional judgment. Users should have influence by being heard and included in decisions as a supplement to the representative democracy (Rønning & Solheim, 1998). In contrast to traditional understandings of public participation, co-creation focuses more on including diverse forms of knowledge to create solutions to complex problems rather than on democratic representation and empowerment (Lund, 2018). The recently renewed interest in the inclusion of public service users in the development of such services as co-creating partners can be

linked to the uprise of the collaborative governance paradigm which recognizes that the complexity of modern societal challenges cannot be solved by public organizations alone (Chris Ansell & Gash, 2008; Røiseland & Vabo, 2016). Co-creation can be seen as the "constitutive principle" (Christopher Ansell & Torfing, 2021b, p. 4) of collaborative governance.

There is no common agreement among scholars on one definition of co-creation or on the difference between co-creation and other concepts of user involvement such as co-production, co-design, or collaboration (Jukić et al., 2019; Nabatchi, Sancino, & Sicilia, 2017). Several diverging definitions of co-creation do exist, but they usually involve a collaboration with relevant stakeholders, for example, users, through active participation in a joint effort of problem-solving or task-solving and value-creation (Venkatram Ramaswamy & Ozcan, 2014, p. 14; Torfing et al., 2019; Voorberg et al., 2015).

Co-creation challenges the traditional role perceptions of citizens as well as of politicians and public officials. Co-creation activities typically involve operations that are in conflict with the characteristics of traditional public administration such as functional division, hierarchy, and management through command and control (Torfing, Sørensen, et al., 2020). Therefore, management support and support from politicians cannot be taken for granted. Some politicians might see their power diminished by the process of co-created policy making, and public managers and employees might experience user input as a threat to their roles as professionals and experts (Bentzen et al., 2020; Jenhaug, 2020). Furthermore, researchers have pointed out that the user's ability to contribute actively and equally in co-creative activities is a prerequisite for the co-creation of value (Osborne, Radnor, & Strokosch, 2016; Skålén, Karlsson, Engen, & Magnusson, 2018). Public services might target user groups with limited possibilities to contribute actively to co-creation processes, for instance due to cognitive impairments, language barriers and more (Bast, Røhnebæk, & Engen, 2021). This has to be acknowledged as a particular circumstance in the context of public service innovation and might influence the way in which user involvement can and should be applied.

Participatory user involvement and user-oriented methods

It is possible to distinguish between participatory user involvement, when users participate actively and directly through participation in brainstorming sessions, idea generation workshops, focus groups, or one-on-one conversations, and user oriented methods such as research of user behaviour through analysis of data on the experience of users with previous or similar services or real-time studies using observational techniques (Sanders & Stappers, 2008; Stickdorn, Hormess, Lawrence, & Schneider, 2018; Trischler & Scott, 2016). The idea of active user involvement through "participatory design" is based on the assumption that if you want to create usable services you should involve the people who are going to use them (Ind & Coates, 2013). Participatory design techniques and methods aim at encouraging users and other stakeholders to contribute with their own experiences and ideas by using a collaborative team approach that allows non-designers to become equal members of the design team (Trischler, Dietrich, & Rundle-Thiele, 2019). Trischler and Scott (2016) analysed three complementary methods for identifying user experience and found that observational techniques alone were not sufficient to understand the user experience. Instead, a combination of the use of observational techniques together with active participation of users through in-depth interviews and collaborative workshops showed the best results. However, as Agger and Lund (2017) point out, the way in which citizens are perceived influences the roles they are offered in public service innovation. The client role is still the dominating view of citizens in large parts of the public sector, for instance, in health care, where patients are frequently seen as passive receivers who lack the capacity to contribute (Agger & Lund, 2017). This perception may limit the use of participatory user involvement approaches. In addition, participatory methods of involving users are more resource intensive than non-participatory methods due to the need to orchestrate collaborative interactions between different actors (Torfing et al., 2019). Consequently, managers might prefer non-participatory methods in order to save resources.

Assistance from external sources

Recent developments in co-creation theory emphasize external relationships as an important factor in the development of public service innovation (Chen, Walker, & Sawhney, 2019; Torfing & Ansell, 2017; Torfing, Cristofoli, Gloor, Meijer, & Trivellato, 2020). The main argument for including multiple external sources in the innovation process is that the diversity and plurality of insights fosters creativity and enables innovation. Multiple inputs including all relevant stakeholders are particularly relevant in the context of the public sector due to the public's right to fair process and equality before the law (Hartley, 2013; Moore, 1995). Individual user input in innovation processes can have a subjective and particularistic character, and some users might have ideas for innovation that cut across the needs of other groups, while other stakeholders might be more articulate or hold greater access to power and influence compared with others (Hartley, 2013). Therefore, innovation in the public sector must consider different motivations and needs. However, the diversity and plurality of insights that might foster innovation might also lead to tensions and dissonance that undermine the intended benefits from such collaboration (Isaksen, 2020; Røhnebæk, 2021; Steen et al., 2018; Wegrich, 2019). It is therefore interesting to analyse whether input from multiple external sources during the innovation process is an important factor in successful public service innovation.

Design thinking

Design thinking has increasingly gained traction as a fruitful approach to public sector innovation (Junginger, 2016; Lewis, McGann, & Blomkamp, 2020; McGann, Blomkamp, & Lewis, 2018). Co-creation is often part of design thinking, which refers to the way designers identify needs, frame problems, generate ideas, develop prototypes, and test solutions (Brown, 2008). Design thinking is an acknowledged approach to innovation and problem solving that emphasizes user or human-centredness (Beckman & Barry, 2007; Micheli, Wilner, Bhatti, Mura, & Beverland, 2019). Theories of innovation stress that innovation is not a linear, sequential process, but instead involves many interactions and feedbacks in the form of knowledge creation and use (Bason, 2018). In addition, innovation is based on a learning process that draws on multiple inputs and requires ongoing problem-solving (OECD/Eurostat, 2018). The integration of "use knowledge" into the idea-generation process has been shown to be an important prerequisite for service innovation (Skålén et al., 2018). Design thinking recognizes that user requirements cannot be clearly known ex ante but can only be truly understood through an iterative process that includes ideation and development (co-design) as well as testing and post-implementation research (Arundel et al., 2018; Stickdorn et al., 2018). Using design thinking in service innovation involves the systematic application of design methodology and principles to public services with the goal of designing those services from the perspective of the user. Opening up the innovation process through design techniques adds new types of knowledge to the process and helps realize outcomes for those who might profit from the innovation (Bason & Austin, 2021). The most important elements in the process include conducting research to identify challenges, conducting research to identify different types of users, brainstorming or idea generation to identify solutions, developing a prototype, and pilot testing (Tschimmel, 2012). Design thinking methods are still not very commonly used methods in public innovation. The most common involvement of users involves low-level participation where knowledge flows in one direction from the citizen to the innovating entity. It is thus possible that co-design is relatively rare, with the involvement of users being greatest at the research and post-implementation stages (Arundel et al., 2018).

The context of governance

The Scandinavian countries have a reputation for being pioneers in design thinking and service design (Mureddu & Osimo, 2019; Sanders & Stappers, 2008). Data from the Co-Val survey shows that Norway is more likely than the average (of six European countries) to draw on businesses and sources linked to co-creation, such as design firms, innovation labs, or living labs (Arundel & Es-Sadki, 2019). The concept of co-creation does not represent something

new in the context of public governance in Scandinavia. On the contrary, looking at local municipalities as an arena for collaboration and resource integration has historically been seen as a common way of governing in the Scandinavian countries (Bentzen et al., 2020; Røiseland, 2016; Røiseland & Lo, 2019). The MEPIN survey of approximately 2000 public sector managers in the Nordic countries found that between 28.1% (Sweden) and 40.0% (Iceland) of managers obtained useful information for their innovations from users (Bugge, Mortensen, & Bloch, 2011). However, there are different forms of co-creation and not all of them are frequently used. For instance, the direct involvement of individual citizens in discussions about how to solve problems in their local community is not that common and could be considered a threat to the value of equal treatment. Furthermore, co-creation in the form of an equal collaboration between public actors, citizens, and organizations would in fact be considered a breach of the representative tradition of public governance in local municipalities (Røiseland & Lo, 2019). Nonetheless, examples of experimentation with task oriented, time limited collaborative arenas, where citizens and elected politicians come together in an equal joint effort to solve specific tasks or problems, do exist (Røiseland & Lo, 2019).

Hypothesis

The involvement of users has been assumed to have a positive effect on innovation outcome. The idea is that involving end-users and other relevant stakeholders widens the knowledge base and brings new perspectives into the innovation process which leads to better products and services and more efficient delivery (Venkat Ramaswamy & Gouillart, 2010, p. 71). However, some researchers also point out that value can not only be co-created but also co-destroyed (Meijer & Thaens, 2020; Skarli, 2021; Steen et al., 2018). It is therefore important to investigate when and how the involvement of users contributes to the success of innovations in the public sector.

Furthermore, there is reason to assume that configurations for successful service innovations might differ by level of government (national or local). Co-creation is said to be more prevalent at the local government level in comparison to the national level because of a greater proximity between service users and public agencies (Christopher Ansell & Torfing, 2021a; C. K. Ansell & Torfing, 2014). In addition, local municipalities are particularly pressured by a combination of rising expectations for service delivery and scarce resources, for instance in the field of health and welfare services. Thus, it can be expected that participatory and user-oriented methods are more important for service innovations at local municipality level in comparison to national government level. Co-creation is assumed to be more effective when integrated as part of a design thinking methodology. However, using design thinking systematically requires knowledge and trained personnel. It could be expected that such competencies are not yet equally distributed among local public organizations and national agencies. Thus, the success of using design thinking as a framework for public service innovation might depend on the input of additional resources. Because local municipalities often are smaller than national government agencies it can be assumed that they are more dependent on assistance from external sources in order to succeed with innovation development. Hence, the hypothesis is that local municipalities are more dependent on a combination of user involvement and user orientation methods as well as the input of additional resources and assistance from external sources compared to national government organizations.

Method and Data

The current study employs fuzzy set QCA (fsQCA), a configurational method that allows for a detailed analysis of how causal conditions (the factors that are addressed theoretically above) contribute to high levels of positive effects on service innovation outcomes, which means that the interplay between these single conditions explains the outcome, not single conditions in isolation. In other words, the recipe is more important than each of the ingredients (Ordanini, Parasuraman, & Rubera, 2014). In contrast to more conventional techniques for analysing systematic fit in a particular configuration, QCA assumes complex causality and uses cases

instead of variables to establish causal relations (Schneider & Wagemann, 2010). Hence, QCA allows us to investigate whether public service organizations follow different configurations of innovation input factors, including different types of resources. Causality in QCA is inferred from a dialogue between empirical, theoretical, and case-based knowledge (Rutten, 2020). Thus, QCA is particularly suited for small and medium-sized samples (10–100 cases) like the one in this study (Ragin, 2014). Familiarity from the cases in this study is derived from the individual case descriptions as well as an extensive preliminary explorative data analysis including various combinations of conditions that are in coherence with theoretical expectational relevance. The conditions that are included in the final model were consistently identified in configurations with good fit according to accepted parameters of fit in QCA, namely consistency and coverage. Consistency resembles the notion of significance in quantitative research and measures the degree to which a configuration is a consistent subset of and therefore sufficient for the outcome. Coverage provides a measure of empirical relevance, and the analogous measure in statistical models would be R2 (Legewie, 2013).

The analyses were performed by using the fsQCA 3.0 software. Ragin (2000) recommends checking for necessity prior to the analysis of sufficiency because necessary conditions can appear to be logically redundant from the perspective of sufficiency. A condition is necessary if, whenever the outcome is present, the condition is present as well. For necessity analysis, a consistency benchmark of at least 0.90 is recommended (Greckhamer, Furnari, Fiss, & Aguilera, 2018). None of the five conditions included in the analysis reached high enough consistency levels to be identified as a necessary condition.

The analysis of sufficiency explains which configurations of conditions are sufficient to produce the outcome. The first step is constructing a data matrix known as a truth table. Each row of this table is associated with a specific combination of conditions, and the full table thus lists all possible combinations. The empirical cases are sorted into the rows of this truth table on the basis of their values on these conditions (Fiss, 2011). Truth table rows without empirical basis were dismissed in this study. In a second step, the number of rows is reduced in line with (1) the minimum number of cases required for a solution to be considered and (2) the minimum consistency level of a solution. For sufficiency analysis, the accepted consistency benchmark is 0.80 for raw consistency (Charles C Ragin, 2000). In this study, the minimum level of consistency in the analysis of sufficiency was set to 0.90 and the minimum number of cases for a solution to be considered was set to 1, which is the default option in the fsQCA software. This resulted in a truth table consisting of 32 configurations to be analysed.[i] The presentation of the results in this study is concentrated on the parsimonious solution because this solution includes only the most important conditions that cannot be left out from any solution and because it is independent from theoretical assumptions.

Data collection

The data used for this article originated from the Co-Val project (https://www.co-val.eu/), which was conducted as part of the Horizon 2020 project on co-creation of value in public services and are linked to a large-scale survey of public administration managers responsible for innovation projects in six countries. The complete questionnaire is available in the report "D2.7 Preliminary survey results" (Arundel & Es-Sadki, 2019). The survey focuses on the use of inputs from external sources, user-involvement, and design thinking in innovative projects in order to produce policy-relevant knowledge of co-creation activities.

The sample for this study used the Norwegian data from the Co-Val survey and consisted of 94 service innovation cases from local municipalities as well as national agencies and ministries in Norway. The sample was split 50/50 between municipalities and national ministries or agencies. The response rate for Norway was 48.1%, but not all of the respondents answered all of the relevant questions for this study. Cases with missing replies were removed from the analysis, leaving 85 relevant cases of service innovations that are approximately evenly distributed between the local and national government level.

National government services covered by the survey include, for instance, inspection activities; planning, operation, and management of public roads and infrastructure; grant

management for the cultural sector; flood, landslide, and avalanche alerts; and accreditation and approval of foreign education and training. Local government services covered by the survey include, for instance, schools and libraries, health care, social work and child welfare, special education for children, water and sewage services, nursing homes for the elderly, and day care for small children. Users of local public services are, compared to users of national government services, more often individuals (citizens and residents) whereas users of national public services more often are other organizations and businesses.

The survey target population consisted of public sector managers within national and municipal governments who were likely to be actively involved in the development and implementation of service innovations for citizens, residents, or businesses. The population of eligible managers was identified using organograms available on government websites. Following other research on public sector innovation, the top management level was excluded in order to ensure that respondents were actively involved in innovation projects (Wagner, Rau, & Lindemann, 2010; Walker, Berry, & Avellaneda, 2015).

Respondents were asked to only respond for their area of responsibility, defined as their work unit. The organization was the government entity that employed the respondent and could be an agency, ministry, or department within a municipality or national government. Respondents were asked to describe their most important service innovation in the previous two years that was partly or entirely developed by their work unit followed by several questions that focused on this most important innovation. Those questions concerned several inputs and methods used during the development of the most important innovation. This approach has been used in innovation surveys in both the private and public sectors (OECD/Eurostat, 2018). A focus on a single innovation can obtain better quality data for innovation inputs and outputs because it does not require the respondent to make averaged estimates for multiple innovations. The survey also contained qualitative descriptions of the individual innovations provided by the respondents. Innovation was defined as a new or improved service or process that differs significantly from the work unit's previous services or processes. The descriptions were used to classify each innovation as either a service or process-only innovation. This way the classification of the innovations did not depend on the respondent's knowledge. However, service- and process innovations are often closely related. The analyses for this article were restricted to service innovations because they contain the main part of the reported innovations in the survey (64%). Due to confidentiality concerns, the exact case descriptions cannot be revealed in this paper. Examples of innovations involve for instance the development of competence and systems to detect bullying in kindergartens, or the development of a certification system for nursing homes which has led to improved services for the residents.

Operationalization and calibration of conditions and outcome

The study applies QCA, which allows researchers to calibrate partial memberships in sets using values in the interval between 0 (no membership) and 1 (full membership). A fuzzy score of 0.5 means neither in nor out of the set and is the point of maximum ambiguity. The outcome variable "positive effects on outcome from service innovation" consists of four service outcome categories including user experience of a service, user access to information, safety of employees or individuals (citizens, residents, etc.), and service quality. Respondents were asked to assess the effects of their most important service innovation on these outcomes, and it was possible to report either positive, neutral, or negative effects. In the context of this study, we are interested in positive effects on outcome from innovation. Full membership in the set "high level of positive effects on service outcome" was achieved when all four outcome categories showed positive results.[ii]

Respondents were asked about five methods for obtaining user input, which were separated into participatory methods and user-oriented methods. The condition "participatory methods" consists of three participatory methods for obtaining user input: in-depth one-on-one research with users, focus groups with users, and the participation of users in brainstorming workshops. The condition "user-oriented methods" consists of two methods for obtaining information on

user experience: analysis of data on the experiences of users with previous or similar services, and real-time studies of how users experience or use a prototype of the innovation.

The survey included a question on any input in the form of assistance, advice, technology, or other forms of input from outside the work unit in the development of the innovation. Possible sources were other government organizations, universities and research institutes, businesses and consultants, design firms, innovation labs and living labs, and ICT firms and software suppliers. The five sources were aggregated into one condition representing the degree of "assistance from external sources". The survey had further questions about the methods that were used to develop the most important innovation and included five methods that are part of a design-thinking process, namely conducting research to identify challenges, conducting research to identify different types of users, brainstorming or idea generation to identify solutions, developing a prototype of the innovation, and pilot testing of the innovation. All design thinking methods were aggregated into one condition representing the degree of "design thinking" used during the development of the innovation. The conditions of "level of government" (national/local) and "input of extra resources" (additional funding and/or additional staffing) were transformed into binary conditions.

Results

Descriptive results

Table 1 shows descriptive statistics for all single variables used to construct the QCA conditions for local and national service innovations. There were significant differences between the national and local government level for most of the included variables. Overall, respondents from national government organizations reported much higher use of methods to obtain input from users in service innovation compared to respondents from local municipalities. For instance, 61% of service innovations at the state level included one-to-one in-depth conversations with users to identify challenges or unmet needs, whereas only 22% of service innovations in local municipalities used this kind of user involvement method. The use of assistance from external sources was also more prevalent at the national level in comparison to the local level. In particular, the use of businesses and consultants (78% versus 21%) and the use of providers of specialized software or ICT equipment (73% versus 32%) was much more widespread on the national government level compared to local municipalities. The use of design thinking methods was more equally distributed between national and local public organisations but was still higher on the national level for all except one of the reported methods. Both government levels reported high percentages regarding the use of brainstorming or idea generation to identify solutions (90% versus 71%) as well as pilot testing of the innovation (78% versus 71%). The biggest difference regarding the use of design thinking methods between the national and local government level was in the development of prototypes (63% versus 38%). The input of extra funding during innovation development was significantly higher on the state level (63% versus 38%), whereas the use of extra staff during innovation development was relatively rare on both government levels (7% versus 11%). All percentages were significantly higher for the national government level in comparison to the local government level except for the variables "input from universities or public research institutes", "research to identify the challenges for the innovation", and "input of extra staff during innovation development".

Table 1 Descriptive frequencies for all variables used in the QCA analysis by level of government

Variables	**National ministries or agencies**	**Local municipalities**
N	38	47
Participatory user involvement		
One-to-one in-depth conversations with users to identify challenges or unmet needs	61%	22%***
Focus groups with users to identify challenges or unmet needs	63%	35%**
Inclusion of users in brainstorming or idea-generation workshops	79%	48%**
User-oriented methods		
Analysis of data on the experience of users with previous or similar services or processes	82%	50%**
Real-time studies of how users experience or use a prototype of this innovation	50%	20%**
Assistance from external sources		
Other government organizations	49%	23%*
Universities or public research institutes	24%	28%
Businesses, including consultants	78%	21%***
Design firms, innovation labs, or living labs	32%	19%
Providers of specialized software or ICT equipment	73%	32%***
Design thinking		
Conduct research to identify the challenges for this innovation	18%	21%
Conduct research to identify different types of users for this innovation	28%	12%
Brainstorming or idea generation to identify solutions	90%	71%*
Development of a prototype of this innovation	63%	38%*
Pilot testing of this innovation	78%	71%
Input of extra resources		
Extra funding	63%	38%*
Extra staffing	7%	11%

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ for differences between the national and local government level

Table 2 shows the percentage of reported positive effects on outcomes for four types of service outcome by level of government. Respondents from national ministries or agencies reported slightly higher percentages of positive effects on service innovation outcomes than respondents from local municipalities. However, both government levels reported high percentages of positive effects on service innovation outcomes except for the outcome category “safety of citizens and residents”.

Table 2 Percent reporting each type of positive service outcome by level of government

Positive outcome	**National ministries or agencies**	**Local municipalities**
N	38	47
Service quality	82%	81%
User experience of a service	79%	72%
User access to information	84%	62%*
Safety of citizens and residents	34%	28%

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ for differences between the national and local government level

QCA results

Table 3 illustrates all configurations that lead to a high level of positive effects on service outcomes from innovation. There are nine configurations in total of which two are related to the national government level, two are related to the local government level, and five configurations for which the level of government doesn't matter, which means they would work for both government levels. All except one configuration for national government level include one or more of the four co-creation related input factors which are described in the theoretical part of the paper.

Table 3 QCA results for a high level of beneficial service innovation outcomes

Configurations	**National**		**Local**		**Both**				
Conditions	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Participatory		●		○	●			●	○
User oriented			●	●			○	●	●
External assistance	○		●			●			○
Design thinking		○					●	○	
Extra resources				●	○	○	○		●
Raw coverage	0.313	0.226	0.104	0.089	0.230	0.174	0.205	0.280	0.147
Unique Coverage	0.088	0.002	0.009	0	0.038	0.016	0.028	0.002	0
Consistency	0.895	0.925	0.977	0.818	0.888	0.972	0.956	0.945	0.874
Total Coverage = 0.67 Solution Consistency = 0.87									

*Notes: Black circles "●" indicate high levels of a condition. Empty circles "○" indicate low levels of a condition. Blank cells indicate an irrelevant ("don't care") condition where the presence of the condition does not matter.

To summarize, the analysis identified the following solutions paths (combination of factors/configurations that lead to the outcome):

1. National government level with low level of external assistance,
2. National government level with high level of participatory user involvement and low level of design thinking methods,
3. Local government level with high level of user-oriented methods and high level of external assistance,
4. Local government level with low level of participatory user involvement, high level of user-oriented methods and extra resources,
5. Both government levels with high level of participatory user involvement and no extra resources,
6. Both government levels with high level of external assistance and no extra resources,
7. Both government levels with low level of user-oriented method, high level of design thinking and no extra resources,
8. Both government levels with high level of participatory user involvement, high level of user-oriented method, and low level of design thinking,
9. Both government levels with low level of participatory user involvement, high level of user-oriented methods, low level of external assistance, and extra resources.

The overall solution consistency (0,87) and coverage (0,67) are high, which means that the results can be interpreted as being a good fit with the outcome (high level of positive effects on service outcomes) and are representative for the cases that went into the analysis. To check for the robustness of those findings, I conducted sensitivity analyses according to common QCA practice. Specifically, I varied the crossover point in the calibration of condition and outcome and the consistency threshold (between 0.8 and 0.9). Minor changes were observed, but the results remained substantially unchanged.

Interpretation of the Findings

This chapter summarizes the main findings of the analysis in light of the theoretical expectations and objective of the paper. The main findings are:

1. User input is an important ingredient in successful public service innovation.

Most of the identified configurations include high levels of participatory user involvement and/or user-oriented methods (six out of nine). This suggests a positive relationship between user input and public service innovation outcome.

2. User orientation, external assistance as well as extra resources more important at local government level compared to national government level.

The majority of the configurations (5–9) showed no differences regarding the level of government (level of government is a "don't care" condition). This means that local and national public organizations have more common than distinctive paths to successful service innovations. However, the four configurations (1–4) in which the level of government does matter seem to indicate that local municipalities depend more on user orientation, external assistance as well as extra resources compared to national government organizations. This is partly in line with the theoretical expectations formulated in the hypothesis in chapter 2. However, the differences are less profound than expected. In addition, participatory user involvement was expected to be more important at local government level because of a closer proximity to users in the daily service delivery. This was not supported by the analysis.

3. The presence of one or two input factors is sufficient to produce the outcome.

The results show that it is possible to concentrate on either participatory user involvement, external assistance, or design thinking in public service innovation management. A combination of several input factors is possible in many cases but is not necessary to reach positive effects on service outcome. A high degree of design thinking only occurs in one of the configurations and not in combination with either method of user involvement or external assistance, which could indicate that these conditions substitute for each other to some degree.

4. User oriented methods have to be combined with other input factors to be sufficient for the outcome.

Non-participatory, user-oriented methods such as the analysis of data on user experience or the observation on user experience in test trials seems to be the most common form of obtaining input from service users, particularly at the local government level, but occurs only in combination with other input factors. In other words, user-oriented methods are not a sufficient innovation tool alone but must be combined with either high levels of participatory user involvement, external assistance, or extra resources in order to be successful.

5. Input of extra resources during innovation development less important than expected.

The input of additional resources during the development of the innovation only occurs in 2 of the 9 configurations and should be absent in three configurations, which means the absence of extra resources is more often sufficient for the outcome than its presence, but most of the time the absence or presence of the condition does not matter. The two times that extra resources are present in the configuration, a low level of participatory user involvement and a high level of user-oriented methods are present as well, which could indicate that the input of additional staff or funding is only useful in combination with high levels of user involvement and user orientation. The relatively low relevance of additional resources during innovation development is somewhat surprising in light of the theoretical expectations.

Discussion and Conclusion

In summary, the findings presented here suggest that user input is an important ingredient in public service innovation. The finding regarding differences in the use of co-creation related

activities between levels of government is somewhat surprising. Local municipalities are expected to have an advantage over public organizations on the national level when it comes to user involvement because of a closer proximity to users (Christopher Ansell & Torfing, 2021a; C. K. Ansell & Torfing, 2014). Furthermore, researchers have pointed out that local governments are particularly pressured by a combination of rising expectations for service delivery and societal problem solving and scarce public resources. Consequently, they must turn to co-creation as a tool for enhancing innovation in order to make ends meet (Bentzen, Sørensen, & Torfing, 2020; Holmen, 2020; Holmen & Ringholm, 2019). Instead, the reported percentages were significantly higher in cases of innovations on the national government level for almost all of the co-creation related activities included in this study. Interestingly, even though the reported use of all input factors was much higher at the national government level, the difference between levels of government was much less distinct in the analysis on outcome effects. This could indicate that local municipalities are better at utilizing their input factors. Another interpretation of this finding could be that it is better to concentrate on a few activities and methods in comparison to a combination of multiple input factors. The QCA shows indeed that high levels of either one of the input factors is sufficient to produce successful service innovations. In other words, high levels of several input factors can be combined, but that will not make a difference for the outcome. This supports co-creation theory, which points to transactional costs connected to the necessity of orchestrating collaborative interactions between multiple actors (Steen et al., 2018; Torfing et al., 2019). Thus, "the more the better" might not apply for co-creation activities in public service innovation. However, non-participatory methods alone are not sufficient to produce the outcome and must be combined with other factors. This supports the findings of other empirical studies showing that observational techniques alone are not sufficient to understand the user experience and should be combined with participatory methods (Trischler & Scott, 2016).

The findings of this study suggest further that successful service innovation at the local municipality level relies more often on non-participatory user-oriented methods than on participatory user involvement. This is somewhat unexpected because they provide services in close proximity to users (like schooling, elderly care, and health care services). A possible explanation for this could be that high levels of participatory user involvement might be deemed inappropriate in cases of service innovations targeting vulnerable users, for instance, children or people in dementia care. The client role is still the dominating view of citizens in large parts of the public sector, for instance, in health care where patients are frequently seen as passive receivers who lack the capacity to contribute (Agger & Lund, 2017). These kinds of services are usually provided by local municipalities. Furthermore, the strong focus on equal treatment as a value of public conduct in the Scandinavian countries (Røiseland, 2016; Røiseland & Lo, 2019) might hinder direct involvement of individual citizens in discussions about how to solve problems in their local community. This perception might limit the use of participatory user involvement approaches in local public services, which often target individual users. However, a high level of participatory user involvement also appears in two configurations where the level of government does not matter and can therefore not be interpreted as a purely national government strategy.

The overall pattern revealed more common features than differences between levels of government regarding configurations that lead to successful service innovation. In fact, public services are highly interconnected and demand close collaboration between levels of governance. This has been acknowledged by the Norwegian government and the Norwegian Association of Local and Regional Authorities (KS) who recently released a cooperation agreement on innovation and sustainable development in the public sector (KMD & KS, 2021). Placing the user at the core of public services requires collaboration and coordination across organizations and government levels (KMD & KS, 2019). Thus, it is likely that in the process of this effort innovation methods will become more homogenous across different public organizations and levels of government.

Finally, the results of this study show that the input of additional resources (such as personal or funding) is either irrelevant or counterproductive in most of the identified

configurations except in combination with user-oriented methods. This finding is somewhat surprising because it is not in line with the theoretical expectations that participatory methods of involving users are more resource intensive than non-participatory user-oriented methods due to the need to orchestrate collaborative interactions between different actors (Torfing et al., 2019). Instead, the findings support the resource integration argument (Frow, Nenonen, Payne, & Storbacka, 2015; Skålén et al., 2018) that proposes that involving users and other relevant stakeholders in the innovation process, and subsequently integrating their resources into it, can also lead to cost reductions and thus reduce the need to allocate additional staff and funding to the innovation process (Jonas, 2018, pp. 50,51).

Managerial Implications

Despite the prominence of co-creation in innovation theory and policy documents, it is still far from being an established, wide-spread approach. Instead, co-creation activities in public innovation are often ad-hoc and experimental (Christopher Ansell & Torfing, 2021). This study contributes with insights that can be used by public managers to facilitate service innovation processes by use of co-creation activities and to integrate such activities into the institutional and administrative routines of public sector innovation. In an extension of the empirical and managerial contribution, the paper contributes to the understanding of differences between the levels of government regarding combinations of input factors that lead to successful public service innovation.

This study shows further that it is not necessary to combine high levels of user involvement, input from external sources, and design thinking in order to achieve high levels of positive service innovation outcome. One of these input factors, when combined with no extra resources, is sufficient to produce successful service innovations. This suggests that public managers are advised to concentrate their efforts on specific co-creation activities. However, non-participatory user-oriented methods, like research on user experience, should be combined with one of the other input factors applied in the study in order to constitute a successful innovation strategy. At the same time, this study also shows that the inclusion of user input does not depend on the input of extra resources. For those in charge of managing and facilitating innovation processes, this is valuable knowledge. This study is based on a broad variety of public service innovation cases that cover different sectors and types of innovations. Given the variety and number of possible pathways to succesful service innovation that were discovered in this study, public managers may choose and apply those combinations of methods they judge to best fit their given context.

Limitations and suggestions for future research

Generalizing the findings regarding government levels in this study to contexts outside of the Norwegian public sector could be problematic. The scope and organization of public services are influenced by history, culture, legal tradition, and other important contextual aspects that differ across countries and welfare systems and make comparisons difficult (Wolman, 2008). However, keeping the contextual importance in mind, inferences might be drawn to countries with similar public sectors like Norway, such as the other Scandinavian countries.

QCA is an exploratory method that produces indications as to which configurations of co-creative innovation configurations are associated with high levels of positive effects on service innvation outcome in a given context. To reach a deeper understanding of the underlying processes, more qualitative research is needed. For instance, a possible way of following up the findings from this study could be through in-depth interviews with public innovation managers who have experience with one or several of co-creation methods mentioned in the survey.

This study by no means claims to assess the value of co-creation in public innovation processes. On the contrary, the author acknowledges the mulitfaceted nature of public value co-creation in the form of democracy, quality, and efficiency as well as new solutions to public challenges (Agger, Tortzen, & Rosenberg, 2018). The findings of the current study are limited to the four service-related outcome categories “service quality”, “user experience of a

service", "user access to information", and "safety of citizens and residents" and rely on the evaluation of public managers for these outcome effects. Despite these limitations, this article is an important supplement to the dominantly normative and case-oriented co-creation literature. In order to establish an evidence-based foundation of co-creation in public service innovation, more quantitative and comparative research on the relationship between collaborative methods and innovation outcomes is needed.

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Appendix

Table 4: Calibration values for conditions and outcome

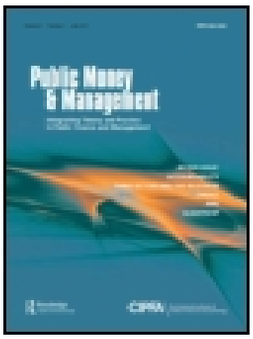
Outcome/conditions	Calibration values
Positive effects on service innovation outcomes (four variables)	0 = 0, 1 = 0.25, 2 = 0.49, 3 = 0.75, 4 = 1
Participatory user involvement methods (three variables)	0 = 0, 1 = 0.33, 2 = 0.67, 3 = 1
User oriented methods (two variables)	0 = 0, 1 = 0.51, 2 = 1
Assistance from external sources (five variables)	0 = 0, 1 = 0.2, 2 = 0.4, 3 = 0.6, 4 = 0.8, 5 = 1
Design thinking (five variables)	0 = 0, 1 = 0.2, 2 = 0.4, 3 = 0.6, 4 = 0.8, 5 = 1

Notes

[i] The truth table is too comprehensive to be displayed here but can be attained by request to the author.

[ii] Details regarding the calibration of outcome and conditions can be found in table 4 in the appendix.

3



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Approaches to co-creating successful public service innovations with citizens: A comparison of different governance traditions

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Approaches to co-creating successful public service innovations with citizens: A comparison of different governance traditions

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IMPACT

This article provides empirically-based insights about the effect of co-creation and citizen involvement on the outcomes of public service innovation in different countries, which can be translated into recipes for successful co-creation. The key finding is that differences in approaches to citizen involvement in successful public service innovation depend on the context of administrative tradition and culture of governance. Therefore, policy-makers and public innovation practitioners need to be aware of the administrative tradition and culture of governance in their country so that recipes for citizen involvement in public service innovation projects can be successfully applied.

ABSTRACT

This article examines how different approaches to co-creation with citizens can positively affect the outcomes of public service innovation. The article uses data collected from a large-scale survey of public managers responsible for innovation projects, and compares two countries (Norway and Spain) with different governance traditions. Through the application of qualitative comparative analysis (QCA), configurations for successful public innovation are identified and compared. The results reveal a positive relationship between co-creation and the outcomes of public service innovation. In addition, while citizen demand is an important driver of innovation in Spain, Norway relies more on co-creation. The article adds to our knowledge of the effect of co-creation on the outcomes of public service innovation in different contexts. As one of the first international comparative studies of co-creation outcomes using quantitative data, this study supplements the dominantly normative literature in this field by providing empirically-based insights.

KEYWORDS

Citizen involvement; co-creation; co-design; co-implementation; public service innovation; QCA; state and governance traditions; service innovation outcomes

Introduction

There is growing acknowledgement among researchers and governments that conventional approaches to public service delivery do not respond to the complexity of contemporary societal problems (see for instance Brandsen et al., 2018)). The need to transform public service production in order to increase or sustain existing service levels (producing more with less) has led to new forms of collaboration with external stakeholders (Bason, 2018; Hartley et al., 2013). The involvement of external actors (such as citizens) as partners in public service development has been described as the 'co-creation of innovation' (Voorberg et al., 2017). Co-creation can arise in the early stages of an innovation process in which problems are detected and defined (co-initiation), or at the stage where solutions and related tools are identified and tested (co-design) (Piller et al., 2010; Røiseland, 2022; Voorberg et al., 2015). Co-creation is therefore understood as the involvement of citizens in the initiation and/or design of public service innovation (Voorberg et al., 2017). However, the actual extent of citizen engagement differs strongly between types of services, organizations and cultural contexts, and attempts by governments to engage citizens are not always successful (Brandsen et al., 2018). In addition, it should be acknowledged that co-creation is not limited to individual citizens but involves a wider community (Steen & Tuurnas, 2018).

Depending on the existing governance tradition, co-creation can fundamentally change the way governments relate to citizens. Countries with different governance traditions will have different preconditions when it comes to applying co-creation as a public innovation strategy (Voorberg et al., 2017). However, there is limited empirical knowledge of the effect of co-creation on innovation outcomes (Krogh et al., 2020; Steen et al., 2018; Torfing, Sørensen, et al., 2020; Verleye, 2015; Voorberg et al., 2015) and the relationship between approaches to co-creation and governance traditions (Peralta & Rubalcaba, 2021; Voorberg et al., 2017). Such knowledge is important for understanding why and how co-creation should be implemented in public innovation. Researchers have argued that the distinctive features of the public sector must be considered in innovation research (for example Fuglsang & Rønning, 2014; Hartley, 2013). This article shows that the administrative tradition and culture of governance must also be considered. Building on Voorberg et al. (2017), I investigated how successful public service innovation projects differ in their approach to citizen involvement, and whether this can be explained by a country's dominant state and governance tradition.

My research questions were:

- Can co-creation be associated with positive outcomes of public service innovation?
- What are the differences between countries regarding their co-creation approaches with citizens in public service innovation?
- How might these differences be connected to governance traditions?

Using data from a large-scale survey of innovation activities in public service organizations, my study explored how different factors (i.e. different forms of co-creation with citizens, management support and the intensity of input from external sources) combine to form successful innovation strategies. I compared how these strategies differ between countries through the application of qualitative comparative analysis (QCA). To illustrate how differences in approaches to user involvement in public service innovation might be connected to each respective country's administrative tradition and culture of governance, I looked at two countries with very different governance traditions: Norway and Spain.

This article adds to a small number of empirical studies that have analysed the effect of co-creation on innovation outcomes, using quantitative data and discusses the findings in the light of governance traditions and approaches to co-creation in public innovation projects (Peralta & Rubalcaba, 2021; Voorberg et al., 2017). I believe this is the first international comparative study of co-creation in public service innovation that applies configurational theory in order to understand the configurations of conditions under which co-creation with citizens can spur successful service innovation.

State and governance traditions as an enabler of co-creation

Comparative international research on public management reform has shown that a country's administrative and legal traditions influence the relationship between politics, citizens and administration (Kuhlmann & Wollmann, 2019; Pollitt & Bouckaert, 2017). These underlying traditions influence how countries implement new trends and emerging paradigms in public innovation and governance. This article focuses on the elements of governance tradition that are relevant to the adoption of co-creation in innovation. Voorberg et al. (2017) identify two relevant aspects: the extent to which countries have a tradition of sharing authority with parties or agencies that are non-governmental; and the culture of governance.

According to the typology of governance systems by Pollitt and Bouckaert (2011), both Norway and Spain belong to the so-called 'Rechtsstaat' tradition of governance, which emphasises the enforcement of laws and rule-following. The actions of both individual public servants and individual citizens are set in a context of correctness and legal control. The typical values of this approach include respect for the authority of the law, attention to precedent, and concern with equity—at least in the sense of equality before the law (Pollitt & Bouckaert, 2011, p. 62). A governance tradition characterized by the rule of law can make it difficult to implement co-creation in public innovation due to a strong emphasis on rules and protocols. Inviting stakeholders to take part in co-creation activities has to be formalized and institutionalized. The Rechtsstaat orientation is an obstacle to co-creation because changes in how services are provided would have to be decided by multiple layers of administrative actors (in a formal consultation), and the authority to make decisions is not delegated to the management level. A strong orientation towards laws and protocols, with a strict and formal distribution of responsibilities, makes changes in governance a difficult process (Voorberg et al., 2017).

Despite this common ground of a Rechtsstaat culture of governance, Norway and Spain differ regarding their respective traditions for collaboration with different stakeholders. There is reason to argue that this implies a different starting point for co-creation (Voorberg et al., 2017). Insights into the peculiarities of the Nordic and Napoleonic administrative traditions follow.

The Nordic administrative tradition

The Nordic decision-making style is consensus-oriented, egalitarian and collaborative (Greve et al., 2020; Lægreid et al., 2016). The Nordic countries have governance traditions that include corporatism and civic engagement through a system of integrated participation in government by stakeholders (Greve et al., 2020; Torfing et al., 2019). This tradition of sharing authority and consulting different stakeholders does not require a fundamental change from the traditional way of governing in order to allow new stakeholders (such as citizens) to become co-creators (Voorberg et al., 2017). Therefore, it could be assumed that the prevalence of co-creation is greater in Nordic countries than in countries that do not have that tradition.

The concept of collaboration and resource integration has historically been seen as a common way of governing in Norway (Bentzen et al., 2020; Røiseland, 2016; Røiseland & Lo, 2019). Collaboration is an everyday practice, but the collaborative structures are institutionalized and formalized, and are therefore relatively resistant to change. Not all forms of collaboration are frequently used. For instance, the direct involvement of individual citizens in discussions about how to solve problems in their local community is not very common, and can be considered as a threat to the value of equal treatment and professional standards that stems from the Rechtsstaat culture of governance (Greve et al., 2020; Røiseland & Lo, 2019).

The Nordic countries share a political culture that emphasises a strong role for the state and a strong public sector ethos. An emphasis on professional knowledge and professional leadership, and a tradition of sovereign political leadership, might conflict with the notion of co-creation that views citizens not as passive recipients but as active and responsible partners in public innovation (Røiseland, 2022). Active individual citizens and public actors who, by their own initiative, contribute with inputs to problems and solutions represents a type of public sector-citizen interaction that breaks with established forms of participation and interaction, and with the established representative system. Co-creation in the Nordics is thus likely to be initiated and organized by the government through institutionalized and formalized arenas of collaboration, such as in the form of co-design whereby citizens are invited by the public service provider to participate in the development and testing of public innovations (Voorberg et al., 2015).

In addition, managerial autonomy is relatively high, and is combined with a low level of polarization, politicization and conflict. Politicians generally accept the expertise of the administrative apparatus, and the administrative staff are also generally highly motivated and professional (Lægreid et al., 2016). Furthermore, Norway is among the countries

least affected by the most recent global financial crisis, and neither has it faced a fiscal crisis similar to that seen in many other European countries (such as Spain). Thus, the pressure on Norwegian public organizations to engage in administrative reform has been relatively low, compared to its European counterparts.

The Napoleonic administrative tradition

The Napoleonic states constitute a sub-family within the Rechtsstaat model—also called the 'Southern model' (Peters, 2008). Spain, together with Italy, Greece and Portugal, has been one of the most faithful followers of the Napoleonic administrative tradition. Although Spain technically has a decentralized administrative model, the process of political decision-making in Spain has traditionally been characterized by a high degree of centralization and strong influence from the political élite on that decision-making process, based upon the Napoleonic tradition. The same élite has retained its position of power over time. It sets the policy agenda and it is the main recruiting ground for both the administrative and political élites (Alba & Navarro, 2011). Many politicians, and personnel linked to political parties, have occupied the upper layers of public institutions, public or semi-public enterprises and other public organizations, creating a tradition of patronage practices (Alba & Navarro, 2011; Alonso et al., 2016). Reform attempts have always been a top-down process, but a group of higher civil servants and political families represent a permanent obstacle to reform, because they perceive reforms as a threat to their political and economic privileges. The Spanish administrative model does not promote the individual authority of managers, due to undefined fields of jurisdiction, insufficient autonomy for decision-making and a lack of personnel trained in the necessary managerial skills (Alba & Navarro, 2011; Alonso et al., 2016). This suggests a latecomer position for the Spanish public administration as regards public sector reforms (Alonso et al., 2016). However, since the most recent global financial crisis, the Spanish public sector has been under pressure to become more efficient.

According to the categories of state and governance traditions proposed by Voorberg et al. (2017), Spain has an authoritative state tradition and, as pointed out earlier, the governance culture is that of a Rechtsstaat model. This combination would imply that the conditions for co-creation are challenging, as it requires a fundamental shift from the traditional form of public service delivery in Spain. Previous studies revealed a hesitant predisposition for innovation in Spain and showed that Spain has difficulty with introducing innovation compared to other countries. In international comparison, public sector managers from Spain generally perceive less focus on collaboration among public sector actors, customer orientation and citizens' participation (Alonso et al., 2016). However, studies also found that, among those innovations that do exist in local Spanish municipalities, the most frequent are those of the collaborative type. These encourage relationships with the external environment, especially with citizens, and revolve around investment in ICTs. Innovations related to the internal management of local governments are less common (Gonzalez et al., 2013) and public managers prefer collaborative approaches and apply a mixed toolbox of both top-down and bottom-up processes (Peralta & Rubalcaba, 2021).

To sum up, according to the theoretical framework proposed by Voorberg et al. (2017), Norway falls into the category of a 'consultative Rechtsstaat', and Spain falls into the category of an 'authoritative Rechtsstaat' (see Table 1).

Based on the respective administrative tradition, it can be assumed that collaboration with external stakeholders during innovation development is more common in the Norwegian public sector than in the Spanish public sector. Drawing on external sources can support better innovation outcomes in the public sector by providing knowledge and expertise that are not available within the organization —thereby reducing the cost and time needed to develop and implement an innovation (Torugsa & Arundel, 2016). Sourcing relevant knowledge from universities (Demircioglu & Audretsch, 2017), or from service design firms and living labs (Hansen & Fuglsang, 2020), can contribute to successful public sector innovation.

The existence of organizational practices to support innovation (such as the managerial autonomy for decision-making) is a factor that positively influences innovation and co-creation (Hartley, 2005, 2013; Voorberg et al., 2015). This suggests that the implementation of co-creation practices in public service innovation requires a more fundamental change in service delivery in Spain than in Norway. Based on a lack of incentive to innovate, a low degree of managerial autonomy and the absence of an existing tradition of collaboration and participation in Spanish public governance, innovation initiatives and invitations to participate are not likely to come from public authorities. In Norway, the public institution is likely both to be the initiator of public innovation processes and to invite citizens, stakeholders or citizen groups into formalized co-creation arenas during innovation processes, while also being sceptical towards individual citizen input outside formalized co-creation arenas. The strong emphasis on equal treatment, as well as professionalism, in the Norwegian administrative tradition may hinder the initiation of innovation through individual citizen demand, as well as the direct involvement of citizens in decision-making processes.

Table 1. Administrative tradition and its presumed effect on factors relevant to co-creation and innovation in Norway and Spain.

	Norway: Consultative Rechtsstaat	Spain: Authoritative Rechtsstaat
Administrative tradition	Consensus-oriented, egalitarian and collaborative.	High degree of centralization, top-down processes.
External collaboration	High degree of collaboration with external stakeholders.	Low degree of collaboration with external stakeholders.
Citizen involvement	Citizens are invited into co-design of public innovations through formalized arenas of participation.	Invitation of citizens into public innovation processes less likely.
Management autonomy	High degree of managerial autonomy for decision-making.	Low degree of managerial autonomy for decision-making.

Data and method

The data for this study came from the 'Co-VAL' project, which includes a large-scale survey of public managers responsible

for innovation projects (see https://www.co-val.eu/public-deliverables/). The data was collected between March 2019 and July 2019 in six European countries that varied in terms of size, economic development and political structure: France, Hungary, the Netherlands, Norway, Spain and the United Kingdom. The analytical process consisted of two steps. First, the entire set of data from six countries was analysed through exploratory statistical analysis. This resulted in the selection of two countries, Norway and Spain, for further comparison by use of qualitative comparative analysis (QCA). The reason for choosing these two countries was that they appeared to be on opposite sides of the user involvement scale regarding citizens as sources of the idea and the use of co-creation methods at later stages of the innovation process. Furthermore, the countries represent different administrative traditions—authoritative in the case of Spain and consultative in the case of Norway. In addition, Norway and Spain had the best response rates in the survey—so their responses were more likely to be representative of their populations. The response rates were 37.7% (264 responses in total) for Spain and 48.1% (167 responses in total) for Norway. Of these, 79.5% (Spain) and 91.0% (Norway) reported that their work unit had had one or more innovations in the previous two years and were classified as innovators, while the remainder were classified as non-innovators. The analysis in this study was limited to service innovations: 93 Spanish innovation cases and 85 Norwegian innovation cases were included in the analysis.

Survey design and data collection

Survey questions were translated from English into Norwegian and Spanish. The questions underwent cognitive testing in each country by means of face-to-face interviews with potential respondents, to ensure that respondents could understand the questions, as intended, and provide reasonably accurate answers (Collins, 2003). Questions were revised as needed. The survey's target population consisted of public sector managers within national and municipal governments who were likely to be actively involved in the development and implementation of service innovation for citizens, residents or businesses. Government departments responsible for the following activities were eligible for inclusion: education, transport, housing and community services, healthcare and social care, culture and recreation, environmental services including parks, water and climate change; and business, energy and industry. Departments that were unlikely to develop services, such as those solely responsible for internal corporate services, regulation and governance, were excluded. The population of eligible managers was identified using organograms available on government websites. Following other research into public sector innovation, the top management level was excluded, to ensure that respondents were actively involved in innovation projects (Wagner et al., 2010). Depending on the country and the size of the government organization, managers were primarily identified at the second to fourth level in the departmental job hierarchy, with a few additional managers from the fifth level. Identified eligible managers were randomly sampled, with contact information obtained from publicly-available data or by telephoning the department. The survey used a combined postal/online protocol, including follow-up reminders by post and email to maximize response rates (Millar & Dillman, 2011).

With a few exceptions relating to the respondent's organization, the questionnaire asked respondents to only answer questions concerning their work unit, defined as 'your area of responsibility, consisting of all employees under your direct management that report to you'. Case conservation methods were used to minimize non-responses to specific questions. For instance, 'don't know' responses were assumed to be equivalent to a 'no' or 'low importance' response, because respondents will remember important factors, such as senior management support for innovation. Respondents from innovative work units were asked to describe their unit's most important innovation in the previous two years and to answer a series of questions on this single innovation. This approach has been used in innovation surveys of both the private and public sectors (OECD/Eurostat, 2018). Focus on a single innovation can provide data of better quality for innovation inputs and outputs because it does not require the respondent to make average estimates for multiple innovations. The descriptions were used to classify each innovation as either a service or process-only innovation.

Qualitative comparative analysis (QCA)

Innovation and co-creation are complex phenomena that are not likely to be explained by single factors. QCA assumes that there are multiple possible ways of combining conditions to obtain a desirable outcome that makes it possible to explore how different levels (high and low) of input factors (i.e. citizen demand, different methods of user involvement, external input, management support and employee engagement) combine to elicit high levels of benefit from public service innovation (Ordanini et al., 2014; Torfing, Cristofoli, et al., 2020; Torugsa & Arundel, 2017). Such an approach is well-suited for testing theories that include combinations of variables interacting in unpredictable ways, rather than as linear, cumulative effects. More precisely, QCA effectively addresses theoretical hypotheses that predict how multiple variables will interact in conjunction at specific levels (high and low) to produce particular outcomes by testing each possible combination of factors at specific levels with a given outcome. The technique is also useful for data with low-to-moderate sample sizes, such as countries or organizations (Longest & Vaisey, 2008).

The 'fuzzy' programme in Stata, developed by Longest and Vaisey (2008), was used in the study. When using fuzzy sets, where set membership can take on any value between 0 and 1, all values for the outcomes and conditions are recoded to fall between 0 and 1. Ranked values above the median represent a 'high' value and are 'in a set', while values below the median level represent a 'low' value and are 'out of a set' (Longest & Vaisey, 2008). QCA reduces the number of configurations by selecting consistency and coverage levels. Consistency resembles the notion of significance in quantitative research and measures the degree to which a configuration is a consistent subset of, and therefore sufficient for, the outcome. Coverage provides a measure of empirical relevance, and the analogous measure in statistical models would be R2 (Legewie, 2013). In fuzzy sets, it is common QCA practice to

accept a consistency benchmark of 0.8 to determine whether each configuration of predictors counts as a sufficient condition for the outcome (Fiss, 2011; Ragin, 2006, 2009). Once the sufficient configurations have been determined, Boolean algebra can be used to reduce the configurations into a more parsimonious solution, using the Quine-McCluskey algorithm. In this way, a logical description of the conditions sufficient to produce a particular outcome can be obtained, and each final solution can be evaluated concerning its coverage of the outcome (Longest & Vaisey, 2008).

Differences in the use of co-creation methods and related input factors during innovation development (descriptive results)

The following section describes the variables that were applied in the analysis and gives an overview of differences in the use of drivers and input factors for Norway and Spain that are relevant to co-creation. An independent t-test was used to test whether the differences in the use of input factors are significant between Norway and Spain.

Citizen demand as a driver of innovation

As Figure 1 shows, there is a significant difference between Norway and Spain when it comes to the importance of demand from citizens and residents as drivers of innovation. This factor is of great importance in Spain but of little importance in Norway.

Methods of involving users

The survey asked questions concerning five methods of involving users in the development of the most important innovation. Each method covered a different stage of the innovation process. Table 2 compares the use of different methods to obtain input from users during innovation development between Norway and Spain. 'Analysis of data on the experience of users with previous or similar services' was the method most used in both countries, with a slightly higher percentage in Norway. Although a sign of user-centredness, this method cannot be characterized as co-creation, as it does not involve users directly. The use of 'in-depth conversations with users to identify challenges or unmet needs' was almost equally reported in both countries. 'Focus groups with users to identify challenges or unmet needs' were slightly more often reported in Norway. Both these methods can be characterized as co-initiation (Voorberg et al., 2015). The most distinct difference in the use of methods to obtain input from users between Norway and Spain was the 'inclusion of users in brainstorming or idea generation workshops', which was far more widespread in Norway than in Spain. The difference was statistically significant ($p < 0.001$). The use of real-time studies of how users experience or use a prototype of the innovation was almost evenly reported in the two countries, with a slightly higher percentage in Norway. The 'inclusion of users in ideation and prototyping/testing activities' can also be characterized as co-design (Piller et al., 2010; Voorberg et al., 2015).

Table 2. Involvement of users by method.

Methods to obtain input from users	Norway (%)	Spain (%)	$p < 0.001$
User research			
Analysis of data on the experiences of users with previous or similar services	64.3	57.5	
Co-initiation			
One-to-one in-depth conversations with users to identify challenges or unmet needs	39.3	41.5	
Focus groups with users to identify challenges or unmet needs	47.6	40.4	
Co-design			
Inclusion of users in brainstorming or idea generation workshops	61.9	22.3	*
Real-time studies of user experience with a prototype of the innovation	33.3	31.9	

External assistance

The survey asked questions concerning the use of five external sources of input for the innovation, and included a sub-question on 'design firms, innovation labs or living labs'. These organizations often provide co-creation services. Table 3 shows that the reported use of external sources was higher in Norway than in Spain in all

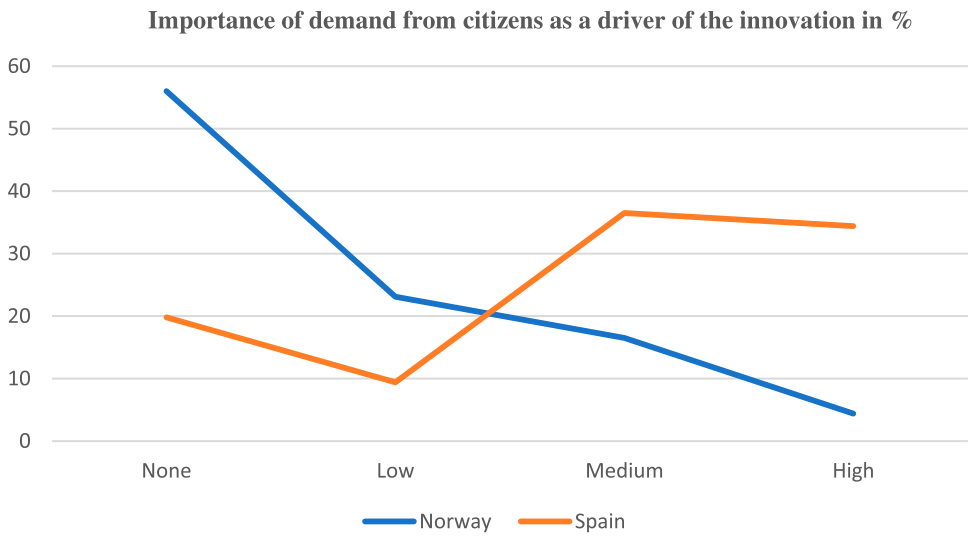

Figure 1. Importance of demand from citizens as a driver of the innovation (in %; $p < 0.001$).

Table 3. Use of different external sources during innovation development.

Source of external input (assistance, advice, technology or other)	Norway (%)	Spain (%)	$p < 0.001$
Other government organizations	35.2	30.2	
Universities or public research institutes	26.1	20.8	
Businesses including consultants	47.7	43.8	
Design firms, innovation labs or living labs	25	4.2	*
Providers of specialized software or ICT equipment	51.1	37.5	

categories; however, this was only slightly in three of the five categories. For two external sources of input the difference was more distinct: Norwegian responders were much more likely to draw on design firms, innovation labs or living labs and ICT firms during innovation development.

Innovation support

A question on the effects of practices to support innovation at the organization level on the attitudes of senior management towards innovation and the attitudes of employees towards their work was included in the survey. Table 4 illustrates how organizational support, in terms of management support for innovation and employee engagement in innovation processes, was significantly higher for Norway in all reported categories. This affirms prior research and theory, which found that support for innovation to be comparatively low in Spanish public organizations.

Outcomes of the innovation

The survey asked questions about the effects of the innovation on nine outcomes, of which five were internal outcomes affecting government processes (for example simpler procedures or reduced costs), three affected users (user experience, user access to information and service quality) and one affected both internal processes and users (safety of employees or individuals). It was possible to report negative, neutral or positive effects of the innovation in each category. The focus for this article was on the positive effects on innovation outcomes—see Table 5. The four outcome categories that affect users can be aggregated into one category of service innovation outcome that can be used to measure the level of achieved outcome. Spanish respondents reported slightly higher percentages of positive outcomes in three of the four outcome categories. Overall, there were no significant differences in reported positive service innovation outcomes between Norway and Spain.

Table 4. Percentage of respondents by country reporting that each innovation support factor 'fully' applies to their organization

Management support of innovation	Norway (%)	Spain (%)	$p < 0.001$
Senior management gives high priority to new ideas or new ways of working	59.3	30.6	*
Senior management supports taking risks in order to innovate	35.2	20	*
Senior management supports an innovation culture that includes all employees in innovation activities	56.4	23.9	*
Employee engagement			
Employees are highly motivated to think of new ideas and take part in their development	26.1	15.7	*
Employees have a sense of empowerment and ownership of their work	44.2	18.4	*

Table 5. Percentage of respondents by country reporting positive effects of the most important innovation in each category.

Service innovation outcome	Norway (%)	Spain (%)
User experience of a service	67.4	62.7
User access to information	61.5	74.1
Safety of employees or individuals	30.4	33.8
Service quality	74.8	80.6

In summary, the main differences between Norway and Spain regarding the importance of drivers and use of input factors in public service innovation can be found in the importance of citizen demand as a driver of the innovation (high importance in Spain, low importance in Norway), the inclusion of users in brainstorming or idea generation workshops (much higher in Norway than in Spain), and the input from design firms, innovation labs or living labs, as well as input from providers of software and ICT equipment (much higher in Norway than in Spain). In addition, respondents from Norway reported higher percentages of innovation support in senior management, as well as employee motivation and empowerment. To investigate whether these differences also appeared in relation to effects on outcomes of the innovation, a qualitative comparative analysis was performed.

The conditional effect of co-creation on innovation outcomes (QCA results)

Figure 2 shows the configurational model for the qualitative comparative analysis. The variables described in the previous section were used to construct seven factors (conditions) that were included in the analysis: citizen demand, user research, co-initiation, co-design, external assistance, management support and employee engagement. In the model, these seven conditions were sorted into three groups of input factors: user input, external assistance and innovation climate. Any of the seven conditions could appear as low or high level in a configuration that leads to the outcome 'high level of positive service innovation outcome' consisting of four service innovation outcome categories.

Table 6 shows the QCA results for the outcome 'high level of positive outcomes for service innovation'. Qualitative comparative analyses identified different configurations of seven conditions (factors) that were associated with a high level of benefits from service innovation. The first half of the table identifies four configurations that produce a high level of positive outcomes for Norway, while the second half gives five configurations for Spain. The consistency level for both models was higher than 0.8 (the recommended minimum level in fuzzy sets). For all configurations combined, the coverage was 42% for Norway and 34% for Spain.

Co-creation related activities were present in three out of five configurations for Spain, and three out of four configurations for Norway. The fact that co-creation was present in most configurations that result in a high level of positive service innovation outcomes in both countries suggests that co-creation is an important ingredient for successful public service innovation. However, Table 6 shows that the combination of factors (configurations) that lead to high levels of benefit from public service innovation differed between the two countries.

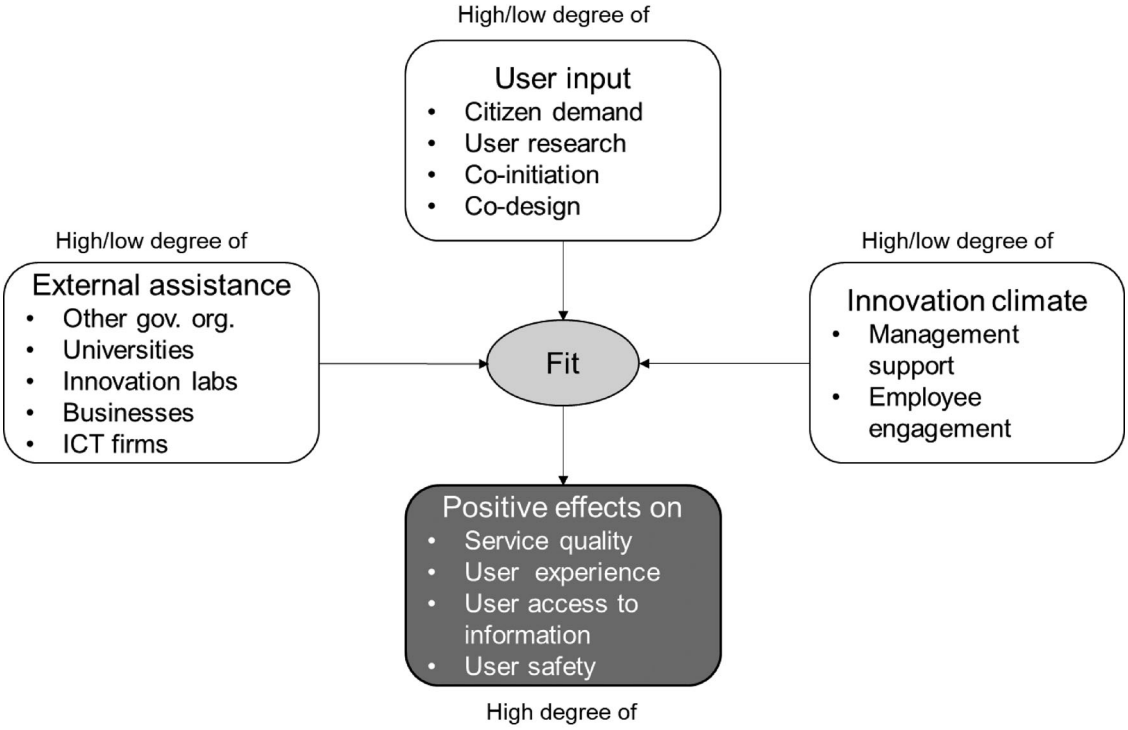

Figure 2. Configurational fit of input factors and outcome.

The inclusion of users to identify challenges or unmet needs (co-initiation), in addition to innovation support from management, was the most frequent condition in successful service innovation projects in Norway. In Spain, citizen demand as a driver of the innovation in addition to research on user experience (with previous or similar services) was the most frequent condition. Interestingly, demand from citizens was absent from all configurations for Norway, but was present in almost all configurations for Spain. This was a distinct difference in the conditions for successful public service innovation in these two countries.

Summary and discussion

The first question in this study sought to determine whether co-creation can be associated with positive outcomes of public service innovation. The results indicate that co-creation is associated with a high level of positive outcomes from public service innovation, as it occurs in most of the configurations in both countries. However, co-creation activities must be combined with other input factors in order to constitute a successful path to public service innovation.

Second, the study investigated the differences between Norway and Spain regarding their approach to involving

Table 6. QCA results for public service innovation with a high level of positive outcomes.

Norway		Total coverage = 0.424; solution consistency = 0.877				
	Configurations	1	2	3	4	
Conditions	Citizen demand	○	○	○	○	
	User research			●	●	
	Co-initiation	●	●	○	●	
	Co-design	○	●	○	●	
	External assistance	○	●	●		
	Management support	●	●		●	
	Employee engagement	●	●	○		
Raw coverage		0.176	0.224	0.076	0.263	
Unique coverage		0.059	0.019	0.049	0.051	
Solution consistency		0.950	0.900	0.939	0.844	
Spain		Total coverage = 0.343; solution consistency = 0.926				
	Configurations	1	2	3	4	5
Conditions	Citizen demand	○	●	●	●	●
	User research	○	○	●	●	●
	Co-initiation	○	○	○	●	○
	Co-design	○	●	●	○	○
	External assistance	○	○		●	○
	Management support	●	●	○		
	Employee engagement	●	●	○	○	
Raw coverage		0.058	0.027	0.064	0.092	0.214
Unique coverage		0.058	0.027	0.013	0.028	0.122
Solution consistency		0.987	0.949	0.985	0.958	0.910

*Notes: Black circles '●' indicate a high level of a condition. Empty circles '○' indicate a low level of a condition. Blank cells indicate an irrelevant ('don't care') condition, where the condition can be at a high or low level.

citizens in successful public service innovations. Configurations for successful public service innovation were found to differ regarding citizens as drivers of the innovation, input from external sources and use of co-creation between the two countries in the study. Norway uses more input from external sources and organized user involvement through workshops, focus groups and in-depth conversations. User demand was of low importance as a driving force for public innovation in Norway but it was of high importance in Spain.

Third, the study analysed how these differences can be connected to governance traditions. Based on the culture of governance and administrative tradition, it was assumed that collaboration with external stakeholders during innovation development would be more common in the Norwegian public sector compared to the Spanish public sector, and that co-creation would be more difficult to implement in Spain than in Norway because the implementation of co-creation practices in public service innovation requires a more fundamental change in service delivery in Spain compared to in Norway. Based on a lack of incentive to innovate, a low degree of managerial autonomy and the absence of an existing tradition of collaboration and participation in Spanish public governance, the innovation initiative and the invitation to participate were thought unlikely to come from public authorities. Despite these challenging conditions for innovation in public services in general and co-creation of public service innovation with citizens in particular, it was possible to identify five configurations that led to successful public service innovation in Spain. Citizen demand as a driver of innovation, in combination with research on user experience with previous and similar services, was the most common combination in successful public service innovation in Spain. High levels of citizen demand and research on user experience with previous and similar services were the most important conditions in the QCA results for Spain, which indicates that these two factors can compensate for a lack of a high degree of co-creation activities and external collaboration. The low importance of demand from citizens for successful public service innovation in Norway may reflect a scepticism towards individual subjective input, which could be seen as a breach with the strong egalitarian tradition in Norway, and as a reflection of a well-organized system of participation that does not rely on citizens' initiative. So it could be argued that co-creation is more institutionalized in Norway than in Spain, building on the existing traditions of participation, collaboration and consensus orientation. The initiative to collaborate lies within the organization, and citizens participate in innovation processes after being invited by the public service provider. The absence of a collaborative tradition in Spanish public governance might explain the importance of demand from citizens as a key driver of public service innovation. Spanish citizens cannot traditionally rely on being invited to participate in public innovation processes and the public innovation rate is relatively low. Thus, citizens must act as initiators and drivers of public service innovation.

To summarise, the results found in this study suggest that:

- There is a positive relationship between the use of co-creation and positive outcomes of public service innovation.
- The extent and form in which co-creation is implemented differs between the two countries in the study.
- The country-specific administrative tradition and culture of governance are a likely explanation for these differences.

However, even though Spain seems to have a more difficult starting point for collaboration and co-creation with citizens in public service innovation compared to Norway, five configurations were found that lead to successful service innovations in Spain, and four of them included citizens and service users. This means that countries that lack a tradition of collaboration and citizen participation in public administration and governance can find ways to create successful public service innovations with citizens and users. The recipes for success, however, are likely to differ.

Limitations and further research

Some limitations to this research should be acknowledged. All data, including data on outcome variables, was based on self-reports by managers, rather than independent sources. This could make the study vulnerable to biased responses from respondents concerning the positive outcomes of innovation. Variation in the number of types of positive outcome was observable, however, indicating that a potential positive bias is randomly distributed among the respondents. In addition, the study was limited to service innovation and four service-related innovation outcomes. Future research could include the effect of co-creation on other types of innovation, such as process innovation or social innovation. Furthermore, other contexts and factors than those included in this study could influence the effect of co-creation activities on the outcome of public service innovation. For instance, the availability of resources could influence the use of co-creation activities and collaboration with external partners such as ICT firms and design firms, innovation labs and so on, and it is reasonable to assume that the availability of resources for innovation processes differs between countries. In addition, the importance of the policy field (for example education or healthcare) or the level of government (national, regional or local) are other contexts that should be explored more with regard to citizen involvement and co-creation activities in public service innovation.

Implications

This study adds to the empirical evidence of the effect of co-creation on public innovation outcomes and extends our knowledge of the influence of state and governance traditions on approaches to citizen involvement in public innovation. The results confirm theoretical expectations and indicate that the way in which co-creation is implemented generally adheres to established traditions of governance, which leads to differing approaches to co-creation between countries. For instance, approaches can differ regarding the degree of institutionalization and the form of collaboration. This is consistent with experience from different types of administrative reform trends that are influenced by the context of the existing administrative tradition. New ideas about governance do not fully replace existing ideas but, rather, co-exist and integrate with established cultures and traditions. Such co-existence is not necessarily peaceful,

depending on the existing tradition (Røiseland, 2022; Voorberg et al., 2017; Ågotnes & Midtgård, 2022). Approaches to citizen involvement in public innovation are more likely to succeed when they are adapted to the context of governance tradition. In addition, the comparison between Norway and Spain showed that co-creation in the form of co-design or co-initiation is not the only route to successful public service innovation. In the case of Spain, the combination of citizen-driven innovation and research into user experience was the most common strategy to achieve a high level of benefit from public service innovation.

The two countries in this study represent types of governance traditions that are applicable to other countries. The Nordic countries have a similar tradition of collaboration, consensus orientation and participation. Thus, experience from Norway could be transferred to, for instance, Denmark or Sweden. Results from Spain are relevant for other countries within the authoritative Rechtsstaat tradition such as Italy and Germany.

This article shows that, although there is no 'one size fits all' approach to co-creation with citizens, there are clear lessons for policy-makers from the Spanish and Norwegian case studies presented.

Disclosure statement

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4

Contractor or co-creator? An empirical analysis on the role of NGOs in public sector service innovation

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Abstract

Previous research suggests that the relationship between non-governmental organisations (NGOs) and governments in respect to public sector innovation is changing from a contractor role for outsourced public services towards a more collaborative approach in which public services are increasingly co-created with NGOs and other actors. This article uses unique data from a survey of NGOs in six European countries to explore the involvement of NGOs in the development of public sector service innovations and to investigate what motivates NGOs to participate in their development. The analysis finds that NGOs play an important role by introducing public service innovations, and by acting as a co-creation partner in government service innovations. The main motivation for NGOs to participate in the co-creation of public service innovation is to improve the user's experience of the service. Additionally, we find that the most innovative NGOs use these co-creation arenas as learning opportunities to gain experience in developing service innovations and to gain insights into user needs.

Keywords

NGO motivation, public service innovation, co-creation, new public governance

1. Introduction

Public innovation often draws on civic actors, such as non-governmental organizations (NGOs), for the development of services (Rønning, Hartley, Fuglsang, & Geuijen, 2022; Windrum & Koch, 2008). NGOs are agents or representatives of civil society (Lang, 2012) that are neither governmental organisations nor commercial (for-profit) organisations. They include non-profits, voluntary organisations, and civil society organisations. Research on the role of NGOs in public service innovation has received renewed interest at a time when many governments struggle to meet citizen expectations to provide innovative solutions to societal problems (Andreassen, 2008; Merlin-Brogniart et al., 2022; V. Pestoff & Brandsen, 2010). The recent renewed focus on the role of NGOs in collaborative public innovation may be linked to the emergence of a New Public Governance (NPG) paradigm in which NGOs are recognized as a valuable resource for public service provision and innovation (Brock, 2020; Loga, 2018; V. Pestoff & Brandsen, 2010).

Collaboration with NGOs may allow public organizations to gain better insight into user needs and how services can be developed more effectively. Yet research on the role of NGOs in public service innovation is limited, particularly through quantitative empirical studies (Ibsen, 2021, p. 10; Osborne, Chew, & McLaughlin, 2013; V. A. Pestoff, Brandsen, & Verschuere, (Eds.) 2012). There is, for instance, a lack of knowledge on how and why NGOs engage in the development of public service innovations (Ibsen, 2021, p. 10). This article argues that the form of NGO contribution to the development of public service innovation can be categorized into non-participatory forms such as the provision of information and expertise, and participatory forms which we define as co-creation activities. The purpose of this article is to investigate whether NGOs participate in the co-creation of public service innovations and their motivations to do so. The research questions are:

1. Are NGOs engaging in the co-creation of public service innovation developed by governments?

and if yes

2. What motivations and characteristics of NGOs can be associated with this engagement?

The article uses survey data from the Co-Val pilot survey of NGOs that was conducted in six European countries: France, Hungary, the Netherlands, Norway, Spain and the UK to investigate whether NGOs participate in the development of public services. The survey is the first of its kind to provide data on the contribution of NGOs to public sector innovations. We use qualitative comparative analysis (QCA) to investigate different combinations of motivations that drive NGOs to actively participate in the development of government service innovations.

The article proceeds with a review of the current literature on the different forms of NGO contributions to public innovation and the factors that might influence NGO participation in the co-creation of public innovations, followed by a presentation of the descriptive statistics, the method, and the results from the qualitative comparative analysis. Finally, the theoretical expectations and implications of the results are discussed. The article contributes empirically based insights on the role of NGOs in public sector innovations, thereby providing a valuable supplement to the dominantly theoretical and case-based literature.

2. NGOs and innovation in public services

While the primary responsibility for public services lies with the government, NGOs often complement government efforts by addressing gaps, providing expertise, and offering innovative solutions to societal challenges (Bovaird & Loeffler, 2012; V. A. Pestoff et al., (Eds.) 2012). In this study public service innovation is understood as a new or improved service. The

main idea is that public services can be renewed and/or improved through the contribution of NGOs.

NGOs have several distinct characteristics, in comparison with government or for-profit businesses, that are advantageous for the development of service innovations for citizens and residents of a specific locality (hereafter referred to as residents). These characteristics include their organisational forms, goals, and practices (Enjolras & Solbu Trætteberg, 2021; V. Pestoff & Brandsen, 2010). In comparison to businesses, NGOs lack profit-seeking motives and have a greater commitment to serving the disadvantaged segments of a population (de Wit, Mensink, Einarsson, & Bekkers, 2019). In addition, NGOs are in a unique position to contribute to service innovations for residents through their experience with community activities and giving citizens a voice, pioneering service innovations that address user needs that are neglected by markets or governments, and enhancing established public services (V. Pestoff & Brandsen, 2010). These experiences can give NGO staff a deep understanding of the problem that public service innovations need to address (Coston, 1998; Crosby, 't Hart, & Torfing, 2017; Windrum, Schartinger, Rubalcaba, Gallouj, & Toivonen, 2016; Yang & Sung, 2016) which makes them a valuable partner for public organizations in the development of service innovations. NGOs can draw on their understanding of user experiences (Crosby et al., 2017; Tuurnas, 2015) to transfer in-depth knowledge of user needs to innovation design teams (Andreassen, 2008; Greenspan, Cohen-Blankshtain, & Geva, 2022) or provide ideas for public sector innovations (Merickova, Nemec, & Svidronova, 2015). NGO personnel that understand user experiences can represent user needs in situations where residents are reluctant or unable to participate (Crosby et al., 2017; Tuurnas, 2015). For instance, in health and welfare services, NGOs can represent service users that are vulnerable due to illness or disability, or otherwise find it difficult to participate in collaborative innovation processes (Andreassen, 2008). Thus, NGOs can have different roles in reforming public service delivery: as a producer of services for citizens and residents, and as

a contributor to government innovations (Loga, 2018). NGOs experience and knowledge gained from their own in-house innovation development could also be applied to assisting the innovation activities of public sector agencies. This relationship could also occur in reverse, whereby interactions with government could encourage NGOs to develop their own innovations (Osborne et al., 2013).

However, there is little data about the form of NGO contributions to public service innovation. We do not know to what degree NGOs develop service innovation for residents themselves or whether they engage in collaborations with government organizations by participating in the idea generation, design, and testing of new solutions or if they are merely providing information, technical expertise or help to identify relevant participants. With the rise of the new public governance paradigm (NPG), the relationship between NGOs and public organizations is believed to change from a contractor type relationship towards a more collaborative partnership in which NGOs participate in public sector activities (Ibsen, 2021, p. 3). The emphasis on collaboration and resource integration in the New Public Governance paradigm should foster a higher degree of NGO-government co-creation activity in public service innovation compared to other governance paradigms such as Public Administration and New Public Management (Brock, 2020). Under new public governance, public sector service innovations should be increasingly co-created through networks and partnerships of organisations, government, and citizens (Merlin-Brogniart et al., 2022). Thus, co-creation in the public domain implies a partnership between public organizations and citizens, NGOs and other relevant stakeholders (Alves, 2013; Brandsen, Steen, & Verschuere, 2018; Hilgers & Ihl, 2010). In this study, we understand co-creation as the active participation of multiple actors in joint activities with the aim to integrate resources and knowledge to define shared problems and identify solutions together (Brandsen et al., 2018; Torfing, Ferlie, Jukić, & Ongaro, 2021; Voorberg, Bekkers, & Tummers, 2015). The idea is that the integration of knowledge and user

experience into the innovation process should provide a better understanding of the actual reality of those that might benefit from the innovation, which in turn is expected to lead to better innovation outcomes (Bason, 2018; Ind & Coates, 2013).

Several scholars argue that the shift in governance paradigms present NGOs with new opportunities to engage in public service innovation (Ansell & Torfing, 2021; Brock, 2020). By fostering partnerships, NGOs can leverage diverse expertise, resources, and networks to implement innovative initiatives. Moreover, collaborative efforts between NGOs and government entities can enhance the overall capacity for public service innovation (V. Pestoff & Brandsen, 2010; Sørensen & Torfing, 2011, 2015). This would imply that a high degree of in-house innovation activity by NGOs could support their value as a co-creation partner for government organizations.

3. Reasons to participate in the co-creation of public service innovation

Even though there is increased focus on the collaboration between governments and NGOs to address societal problems through innovation, little is known about why NGOs engage in the co-creation of service innovations with government organizations (Van Puyvelde & Raeymaeckers, 2020). Such knowledge is important to help foster NGO participation in public innovation projects. NGOs are not immune to self-interest even though they should be committed to the interests of the people they are representing (Provan & Lemaire, 2012; Van Puyvelde & Raeymaeckers, 2020). For instance, NGOs could also be looking to improve their relationship with governments (Greenspan et al., 2022) by engaging in government projects or to expand on their own networks by using co-creation activities as a networking opportunity (Loureiro, Romero, & Bilro, 2020). Community oriented NGOs can engage in participatory processes to increase community support for an innovation or they may act as advocates of user

needs to improve the user experience of a new service or help to generate community consensus for government initiatives (Greenspan et al., 2022).

Many NGOs depend on public funding and public facilities and prior empirical research has shown that NGOs are more likely to participate in public sector innovation projects if they receive public funding for their own innovation activities (Ibsen, 2021; Osborne et al., 2013). NGOs require adequate resources and capacity to participate in co-creation effectively. Sufficient funding, skills, and access to relevant data and information are necessary for NGOs to actively engage in the innovation process. Thus, a lack of resources or capacity constraints could hinder their participation. On the other hand, when organizations engage in collaboration with other organizations and form network ties, they can also benefit from the collective resources brought to the collaboration (Loureiro et al., 2020; Provan & Lemaire, 2012). Hence, scarce internal resources could motivate the NGO to strategically seek resources through partnerships and to collaboratively develop resources with external partners (Loureiro et al., 2020; O'Brien & Evans, 2017).

Based on the existing literature, we assign these motivational factors to three categories: Internal benefits (increase relations with government, networking opportunities), external orientation (increase community consensus and improve user experience), and learning opportunities (gaining experience with developing innovations, and insights into user needs). In addition, the expectation of funding could also motivate NGOs to participate in government innovation projects (Osborne et al., 2013).

4. Research design and data

This study uses data from the Co-Val pilot survey of NGOs, conducted between January and June 2020 in six European countries: France, Hungary, the Netherlands, Norway, Spain and the

UK. The survey is the first of its kind to provide data on the contribution of NGOs to public sector innovations. The analyses use the survey data to identify how NGOs are involved in government innovation projects, for instance whether they have an active role in co-creation or a minor role. The pilot survey covers both the internal and external innovation activities of NGOs because skills learnt to develop innovations in-house could also be applied to assisting the innovations activities of public sector agencies. We use qualitative comparative analysis (QCA) to identify combinations of factors that support a high level of NGO participation in co-creation activities. The QCA results are then compared to regression analysis using the same set of variables.

Due to the absence of a statistical definition of an NGO and population data for NGOs in each country, it was not possible to take a representative sample. Instead, a list of NGOs in each country was constructed from web searches using terms such as ‘charities’, ‘NGOs’ and ‘non-profits’ and from existing lists of national NGOs, if available. To be included in the survey, NGOs needed to provide social, health, education, or housing services to individuals in the country where they were located and have a minimum of 10 staff. This information was obtained from each NGO website. NGOs that did not provide services to individuals within the country of location or which only advocated or lobbied for social or political change were excluded. Given the small sample size, results for specific countries are not provided.

The survey questionnaire was translated into national languages and underwent cognitive testing in the UK, Spain, Norway and the Netherlands (two cognitive testing interviews per country). After both major and minor revisions as a result of cognitive testing, the final version of each questionnaire was also translated into the national languages. An initial section of the final survey questionnaire covered the characteristics of the NGO. The second section covered the NGOs own innovation activities, while the third section determined if the NGO assisted government organisations in developing new or improved services and, if yes, included several

questions on the NGO's participation in the development of a single (focal) government innovation, including participation in several types of co-creation activities and the motivation for participation.

The target sample size for the three large countries (France, Spain and the UK) was 60 NGOs and for the three small countries 40 NGOs, but the sample of the larger countries was increased to improve coverage. The target response rate was 40% and 120 responses, with a mixed postal/online survey method used to increase response rates (Dillman et al, 2009). Table 1 lists the number of sampled NGOs and valid returned questionnaires by country. In total, 112 responses were collected (72 online and 40 by post), but 13 online responses were excluded because respondents answered none or only a few questions. The average response rate for completed responses is 28.4%, with considerable differences by country, from 6.9% for the UK to 60.0% for Norway. The lower than expected response rate was partly due to the Covid pandemic, which caused the second postal reminder to be sent online, delays in follow-up, and very low contact rates for telephone follow-up calls, due to the norm of working from home.

Table 1: Number of sampled NGOs and responses by country.

Country	Sample size	Postal replies	Online replies	Total replies	Response rate
Norway	40	10	14	24	60.0%
Hungary	40	9	9	18	45.0%
Netherlands	39	2	11	13	33.3%
Spain	74	11	13	24	32.4%
France	84	4	10	14	21.4%
UK	72	4	2	5	6.9%
Total	**349**	**40**	**59**	**99**	**28.4%**

4. Survey results

4.1 NGOs as developers of new or improved services for citizens or residents

Respondents were asked if their NGO had developed or implemented each of eight types of new or improved services for citizens or residents plus an 'other' category in the previous two years. This variable is the condition used in the QCA to capture the level of own innovation activity for each NGO. In total, 87.9% of NGOs reported at least one type of service innovation with a mean of 1.9 reported innovation types and a maximum of 9 innovation types, while 12.1% reported no service innovations. Figure 1 shows the percentage of respondents who reported each type of service innovation. The most common type is 'educational or training services' at 46.5%, followed by 'social support services', at 33.3%. These reflect the activities of the respondent NGOs, for example NGOs active in health are likely to report health service innovations.

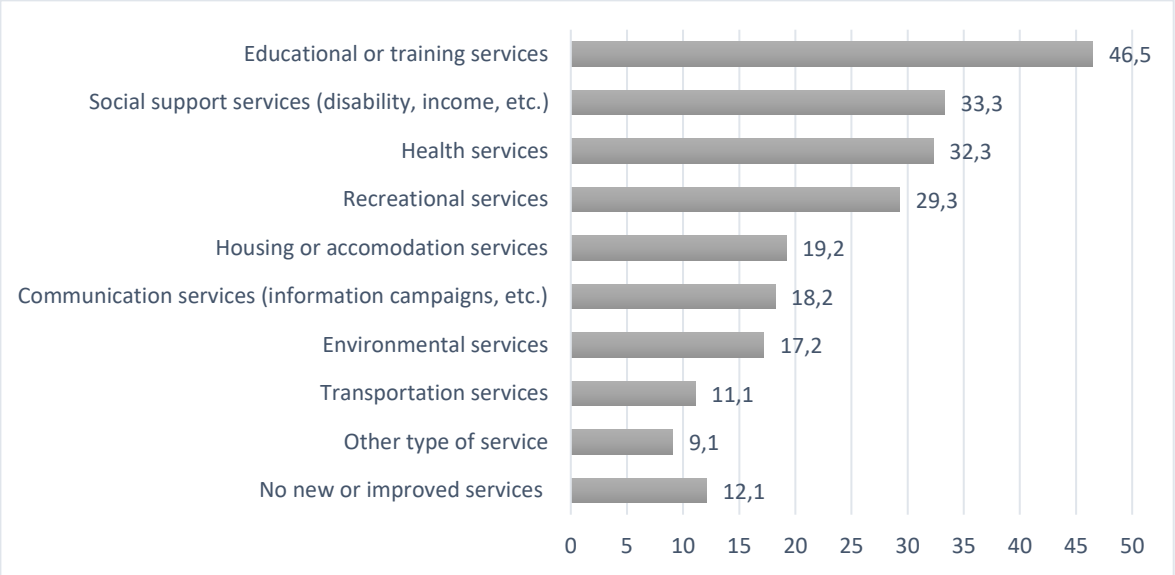

Figure 1: Percent respondents who reported each type of service innovation in the previous two years, N=72

The percentage of NGOs with one or more service innovation (a definition of their innovation status) is positively correlated with the size of the NGO, measured both by the number of volunteers ($p = 0.031$) and the number of paid employees ($p = .041$). For example, 95% of NGOs with more than 50 volunteers were innovators, compared to 80.8% of those with

less than 50 volunteers. This size effect is common in both the public and private sector and is due to larger organizations having greater resources and more activities that would benefit from innovation (Damanpour, 1992). Of note, innovation status is based on service innovation. The non-innovators may have introduced a different type of innovation such as a process or administrative innovation. The high percentage of innovative NGOs indicates that NGOs play a significant role in the development of services to citizens and residents.

4.2 NGOs as contributors to government service innovation

Section 3 of the questionnaire asked respondents "In the last five years, did your organisation provide advice, expertise, data or other inputs to assist a local, regional or national government organisation to develop a new or improved service?". As shown below in Table 2, 45 out of 83 respondents (54%) answered that they had provided assistance to a government service innovation. These 45 NGOs are used in the QCA. Over twice the percentage of innovative NGOs versus non-innovators responded that they assisted government innovations (58.3% versus 27.3%, p = .054). The second question of section 3 asked respondents to describe "the most important new or improved service by a government for which your organization provided input". All other questions in this section referred to this single, focal innovation in order to improve data quality and accuracy (OECD/Eurostat, 2018, chapter 10).

Table 2: Percent NGOs assisting a government innovation, by innovation status

	N	No	Yes
Non-innovator	11	72.7%	27.3%
Innovator	72	41.7%	58.3%
Total count	83	38	45*

*Sample for the QCA.

Figure 2 below shows the characteristics of the reported single government service innovation for which the NGO provided assistance (more than one characteristic can be cited). Education or training is the most commonly cited type of government service innovation, followed by health and social support services. There is a strong correlation between the type of service innovation developed by NGOs themselves (figure 1) and the characteristics of the assisted government innovation ($R^2 = 0.767$).

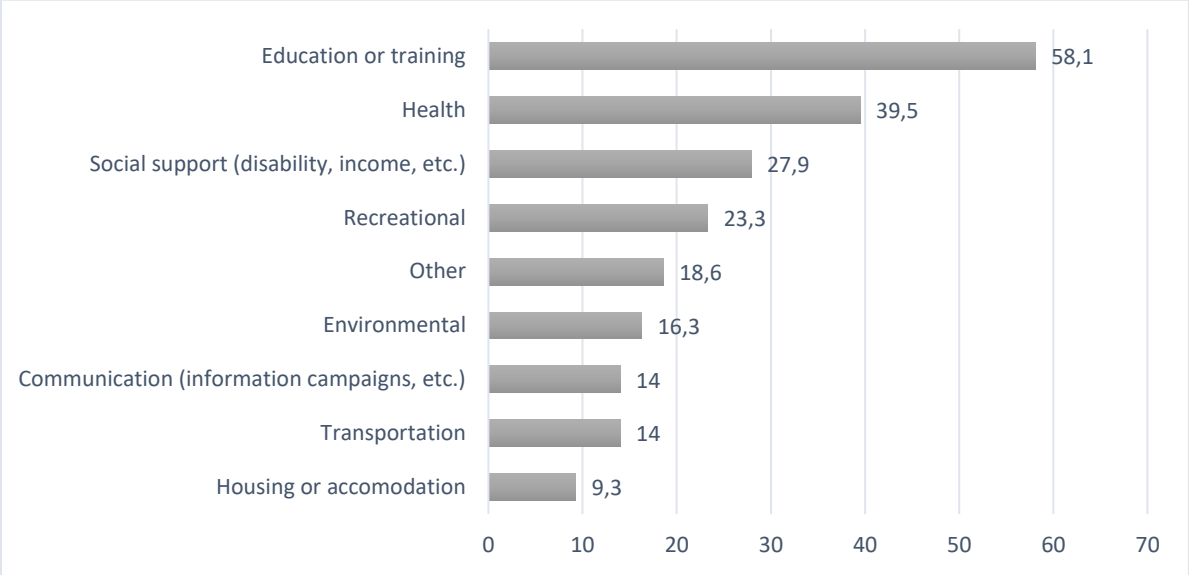

Figure *2*: Percent distribution of NGO assisted government service innovations by type, N= 43

Form of contribution

NGOs, who assisted a government service innovation were asked about seven methods of contributing to the development of the innovation, plus an "other" option. The percent that contributed to each method is given in Table 3. Only 2.4% of respondents reported only one method, with a median number of four methods. This indicates a real and intense collaboration between NGOs and government organizations during the development of the innovation.

The most cited contribution methods are participating in brainstorming, discussion groups or idea generation workshops; followed by providing information on the experiences of citizens

or resident with similar services. Participating in the evaluation of the service after its implementation is the least cited form of contribution. This confirms previous research (Eimhjellen, 2021) that found that NGOs are mostly involved in the early stages of the innovation process, with a focus on identifying the problem and contributing information on user needs.

How NGOs contribute to the development of a government service innovation is divided into two types. The first consists of active NGO participation (co-creation), where NGO staff draw on their understanding of user needs to directly contribute to four co-creation activities including idea generation (question 1 of Table 3), designing (question 3), testing (question 4) and evaluation (question 8) of the service innovation. These four items were used to create the outcome variable for the QCA that reflects a high degree of NGO participation in the co-creation of government service innovation. These four items are shown in table 3 with a grey background. The calibration for QCA is shown in appendix A and explained in the QCA section. Almost all, 97.6%, of respondents reported one or more of these four co-creation methods, with a mean of 2.6 co-creation activities. These contributions of the NGO could be particularly important when it is a challenge to find sufficiently knowledgeable or motivated citizens (Schmidthuber, Piller, Bogers, & Hilgers, 2019; Strokosch et al., 2018, pp. 18-19).

The second type of contribution consists of three non-participatory inputs where NGO staff are not actively involved in co-creation activities, including providing information on user experiences (question 2), technical expertise (question 5) and helping to find potential users to participate in developing a service innovation (question 6).

Table 3: Type of NGO-contribution to the development of the government service innovation, percent respondents

Type of contribution	Percent

1. "Participated in brainstorming, discussion groups or idea generation workshops to identify problems to be addressed by the service."	81%
2. "Provided information on the experiences of citizens or residents with similar services or on their needs for this service"	76%
3. "Assisted with the design of the new or improved service (characteristics of the service, delivery method, etc.)"	69%
4. "Participated in tests of how people experience or use a prototype of this service"	55%
5. "Provided technical expertise (ICT, scientific knowledge, etc.)"	50%
6. "Helped find citizens or residents to participate in the development of this service (i.e. provide user views)"	50%
7. "Other"	7%
8. "Participated in an evaluation of this service after its implementation"	5%

N = 42. Questions listed in declining order of a positive response.

Motivation to participate in co-creation

Eligible respondents were asked about the importance of six reasons for their NGO to participate in the development of the new or improved government service innovation (see Table 4). The most frequent 'high importance' reason is to improve user experience (cited by 73.8%), followed by improving community consensus in support of the innovation (52.4%). The least frequently cited high importance reason is "Networking opportunities with other individuals and organizations (NGOs, non-profits, businesses, etc.)", cited as high importance by 31% of respondents. These reasons to participate are aggregated into three types of motivation-conditions: an external motivation to improve user experience of the innovation and

community acceptance (items 1 and 2), learning opportunities for the NGO to gain insights or experience (items 3 and 5), and internal benefits for the NGO such as an improved relationship with government or networking opportunities (items 4 and 6). These three conditions are explored further as conditional factors for co-creation with government in the QCA. The results for the aggregated variables are also shown in appendix A and further explained in section 5.

Table 4: Importance of reasons to assist the development of the government service innovation

	Importance				
	None	**Low**	**Medium**	**High**	**Total**
External reasons					
1. "Improve the user experience of the new or improved service."	9.5%	4.8%	11.9%	**73.8%**	100%
2. "Improve community consensus in support of the new or improved service."	11.9%	14.3%	21.4%	**52.4%**	100%
Learning opportunities					
3. "Gain insights into the needs of the users of this service"	11.9%	9.5%	33.3%	**45.2%**	100%
4. "Gain experience in developing new or improved services."	21.4%	9.5%	38.1%	**31.0%**	100%
Internal benefits					
5. "Improve relationship with government"	16.7%	21.4%	28.6%	**33.3%**	100%
6. "Networking opportunities with other individuals and organizations (NGOs, non-profits, businesses, etc.)"	21.4%	16.7%	31.0%	**31.0%**	100%

N = 42. Questions listed in declining order of 'high' importance.

NGOs may engage in co-creation of government innovations due to funding incentives. To capture this, the QCA includes a variable indicating whether the NGO anticipates receiving government funding for the new/improved service. The results reveal that 43% expect government funding, while 57% do not.

5. Qualitative Comparative Analysis (QCA)

We use QCA to evaluate combinations of factors that affect the NGO's level of co-creation when engaging in the development of public service innovation. QCA analyzes complex causal relationships through the use of Boolean algebra (Rihoux & Ragin, 2008; Schneider & Wagemann, 2012) and is increasingly used in research on non-profit organizations (Carboni, 2016; Taylor, Torugsa, & Arundel, 2017; Taylor, Torugsa, & Arundel, 2020). QCA follows a set-theoretic logic that views all observations (each NGO in this study) as members of one of two sets for each *condition*. Condition is the QCA term corresponding to an independent variable in regression analysis. Binary conditions are easy to include in QCA, while discrete or continuous conditions can be calibrated in two ways; either to high (1) or low (0) levels (based on a chosen crossover point) or ranked "discrete-wise" from 0 to 1, where the crossover point for set-membership is 0.5. The latter is referred to as a fuzzy variable and the observations are then more or less 'in or out' of the two sets (Ragin, 2000). This study includes both binary and fuzzy conditions. The calibration for all conditions in the analysis is provided in Appendix A.

QCA begins by producing a "truth" table in three steps: the identification of all logically possible configurations of the conditions of interest, the assignment of each case to one of the truth table rows, and the definition of the outcome values for each row (The truth table is provided in Appendix B). Based on the truth table, necessary and sufficient conditions for the outcome can then be identified (Cooper & Glaesser, 2016; Schneider & Wagemann, 2012). A *sufficient* condition is a condition or set of conditions that is sufficient to produce the outcome

Conditions are *necessary* when the outcome does not occur without that condition present (Ragin, 2000). No necessary conditions were identified in this analysis.

QCA can identify multiple causal "recipes" that lead to the outcome of interest (Ragin, 2000). These recipes are identified through a logical minimization process where the truth table is reduced to its "minimal formula" that produces the outcome. This is done through selecting and evaluating levels of consistency and coverage (Longest & Vaisey, 2008). Consistency assesses the degree to which a subset relationship has been approximated, whereas coverage assesses the empirical relevance of a consistent subset (Ragin, 2006), i.e how much of the outcome is covered by the solution model. The recommended minimum consistency level is 0.75 (Ragin, 2000).

For the QCA analysis in this study, the outcome is high versus low levels of NGO participation in the co-creation of government innovations through involvement in items 1, 3, 4 and 8 of Table 3. Six conditions are included in the QCA. The first is the number of different types of service innovations implemented by the NGO itself, as identified in Table 1. The NGO's own experience with innovation is expected to improve its expertise in innovation and thus affect the level of co-creation in government innovations. Three motivation conditions for the NGO to participate in developing the government service innovation are explored. These involve the importance of external motivation, internal benefits and learning opportunities (indicators from table 4). The three conditions reflect whether the NGO has reported one or more indicators as a high importance reason to participate. The fifth condition is whether the NGO expects to obtain funding to provide this new or improved service to citizens or residents, which could provide an additional motivation to participate in co-creation activities. A sixth condition is included, to control for NGO size, which may affect the amount of resources that each NGO has to participate in resource-intensive co-creation activities (Damanpour, 1992).

All conditions and their calibration are further explained and shown in the tables in Appendix A.

QCA and regression results

Table 5 gives the final QCA solution set for a high level of participation in co-creation activities to develop a government service innovation. Solid black circles indicate the presence of a high level for a condition, white circles indicate the absence of high levels, and no circle indicates that the condition doesn't matter (it can be low or high). The results identify five configurations (recipes) that lead to a high level of NGO participation in co-creation. The full solution has a coverage of 55% and a consistency level of 0.89, well above the minimum of 0.75 suggested by Ragin (2000).

Table 5: QCA solution for high levels of NGO participation in co-creation activities for a government innovation

High levels of co-creation

Config-uration	NGO innovation experience	Internal benefits	External reasons	Learning Opportu-nities	Expec-tation of funding	NGO size	Raw Coverage	Unique Coverage	Consis-tency
1		○	●	●			0.24	0.12	0.90
2			●	○	●	○	0.10	0.06	0.89
3	○		●		●	●	0.18	0.13	0.88
4	●		●	●	○	○	0.19	0.02	0.94
5	●			●	○	●	0.17	0.004	1

Total Coverage = 0.55;

SolutionConsistency = 0.89

The grey part of Table 5 shows three configurations for NGOs that do not include high levels of experience with developing their own service innovations, while the other two configurations (4 and 5) are for NGOs with high-level experience with service innovations. Two configurations

include large size NGOs (3 and 5), while configurations 2 and 4 include small NGOs. There is no linkage between NGO size and the expectation of funding, with the expectation both present and absent for large and small NGOs.

Four conditions could play a role in motivating NGOs to participate in a high number of co-creation activities for government service innovation: external reasons (improving user experience and community consensus), learning opportunities, internal benefits (networking opportunities and an improved relationship with government), and the expectation of government funding. “External reasons” is the most common motivator (present in 4 out of 5 configurations) and always present when the NGO innovation experience level is low. A common reason for NGOs with high experience with innovation to participate in the co-creation of government innovations is “learning opportunities”. A high level of internal benefits is ‘don't matter’ in four configurations and absent in one configuration. These indicate that a motivation to obtain internal benefits is not a strong motivator for participation in a diversity of co-creation activities. An expectation of government funding as a motivator for participation is present in two of the three configurations for NGOs with low experience (1 to 3), absent in the two configurations (4 and 5) where NGO innovation experience is high, and not relevant in the first configuration for low experience NGOs. These results indicate that government funding has a much more ambiguous role in NGO participation in government innovation than might be expected. Funding and learning opportunities as a motivator for participating in co-creation activities never occur together, but one is always at a high level.

The negated QCA model to identify configurations that are linked to low levels of participation in co-creation activities was also tested, as is good QCA practice (Schneider & Wagemann, 2010). However, all negated models had very low consistency and are therefore not presented and evaluated. An analysis of necessity finds that none of the conditions are necessary for the outcome (<0.9 consistency) (Torfing, Cristofoli, Gloor, Meijer, & Trivellato,

2020). The truth table in appendix B also reveals that there are no contradictory rows that to be solved, i.e. cases assigned to the same configuration, but belonging to different outcome sets.

The same variables were also tested in an ordered logit regression analysis to test the robustness of the results and compare differences between regression and QCA models (Table 6).

Table 6: Ordered logit regression model for NGO participation in co-creation activities with government

	Coeff /	Std.Err	sig
Innovation experience	0.50	0.19	**
External reasons	1.36	0.88	
Learning opportunities	0.21	0.70	
Internal benefits	-1.47	0.68	*
Expectation of government funding	0.50	0.63	
Size	0.12	0.20	
Number of observations	39		
LR chi2	15.06		
Model Significance	0.02		
Pseudo R2	0.13		

* $p < 0.05$, ** $p < 0.01$,

The regression analysis estimates the effect of each variable, but it does not use a set theoretic method that can identify combinations of variables that are associated with the outcome. Consequently, a variable that is associated with the outcome when combined with other variables in a QCA analysis can lack statistical significance in a regression (or vice versa).

Innovation experience is the largest contributor in the logistic regression, which supports the results in configurations 4 and 5 and the finding that only one configuration (3) includes a low NGO innovation level. Internal benefits are statistically significant, but negatively correlated

with the outcome. That also supports the QCA results, with no configuration including a high level of internal benefits. Conversely, neither the expectation of funding nor learning opportunities are statistically significant, whereas both are present at high levels in the QCA analysis. High levels of external reasons are present in four of the five QCA configurations, but the variable has no significant effect in the regression. These comparisons between the QCA and regression analysis results shows that QCA can identify important contributory variables that are not visible in a regression.

6. Discussion and conclusion

The objective of this article is to add to the limited amount of knowledge about how NGOs contribute to public service innovations by investigating whether NGOs participate in the co-creation of public service innovation and their motivations to do so. First, the article finds that there is a relatively high percentage of NGOs that assist government innovation projects (45%), particularly among those NGOs that have experience with developing their own service innovations (58.3%). Among NGOs that assist government service innovations, almost all (97.6%) are involved in co-creation activities. The high level of NGO participation in the co-creation of public service innovations suggests that the relationship between NGOs and government builds on the collaboration of public and civil actors in the development of public service innovations. This provides support for the new public governance paradigm and the collaborative innovation literature that emphasize the role of NGOs as a co-creation partner in public service innovation (Bovaird & Loeffler, 2012; Brock, 2020).

Second, the article investigates why NGOs participate in the co-creation of public service innovations, i.e. their reasons to participate. We argue that possible motivations for NGOs to participate in government innovation projects can be sorted into three categories: 1) external motivation to improve user experience of the innovation and community acceptance, 2) learning

opportunities for the NGO to gain insights or experience, and 3) internal benefits for the NGO such as an improved relationship with government or networking opportunities. Additionally, we included conditions representing the degree of each NGO's experience with service innovation development, the size of the NGO as well as the expectation of funding when engaging in government innovation projects. These factors can be expected to influence NGO innovation capacity and the motivation to engage in public innovation projects (Damanpour, 1992; Ibsen, 2021; Osborne et al., 2013).

The survey results show a positive correlation between the NGO's own experience with developing innovations and the degree of collaboration with government in public service innovation. This indicates that experience with developing service innovations is an important factor in the involvement of NGOs with government service innovations. In total, 58.3% of the NGOs that developed their own service innovations assisted a government service innovation, compared to only 27.3% of non-innovative NGOs. However, the QCA results give a more nuanced picture, showing that NGOs with little or no own innovation experience are also active in co-creation activities with government. This finding could be due to NGOs wishing to build their own innovative capacities (Loureiro et al., 2020; Osborne et al., 2013). If the process of innovation is part of an interaction between organizations and the networks to which they belong, then the integration into public service networks is likely to foster innovative activity in the partaking organizations (V. Pestoff & Brandsen, 2010), such that experience with government innovation processes could also lead to learning that increases the abilities of NGOs to develop their own innovations. This could explain QCA configurations 4 and 5, limited to highly innovative NGOs. For these NGOs government funding is not an important motivator for high levels of participation in the co-creation of public service, but learning opportunities are an important reason. The size of the organization, which is known to affect innovation capability, did not appear to be a decisive factor for NGO engagement in public

service innovation as the QCA analysis reveals that both large and small NGOs can engage in high levels of co-creation with government.

The most important factor for NGO engagement in co-creation activities is a motivation to improve user experience of the new or improved service and to improve community consensus of the service innovation. Non- governmental organizations that focus mainly on internal benefits for their organization are the least likely to engage intensely in the co-creation of public service innovation. The relationship between high levels of participation in co-creation and service improvement is not surprising, since co-creation is considered to be particularly relevant to services and service innovation as a way of integrating user experiences and use knowledge (Alves, 2013; Farr, 2013; Lusch & Nambisan, 2015; Skålén, Karlsson, Engen, & Magnusson, 2018; Stickdorn, Hormess, Lawrence, & Schneider, 2018; Vargo & Lusch, 2008).

The reviewed literature concentrates mainly on the contribution of NGOs to public service innovation based on their perceived organizational advantages and by providing input and insights in connection to user needs and service experiences (Enjolras & Solbu Trætteberg, 2021; V. Pestoff & Brandsen, 2010). We confirm this role of NGOs, but also note the importance of the transfer of knowledge from public organizations and public innovation processes to NGOs. Our research indicates that participating in public service innovation projects presents learning opportunities in connection to gaining experience with service development and gaining insights into user needs. Such insights should foster the innovative capacity of NGOs.

Limitations and future research

An important limitation is the lack of a population database for NGOs and the small sample size, which limits the representativeness of the data. These two limitations also prevented comparative analyses between the countries included in the sample. Different countries have different traditions for collaboration between the public and the third sector that are expected

to influence NGO engagement in public service innovation (Enjolras & Solbu Trætteberg, 2021; Gesierich, 2023). However, a check of the source country of the NGOs included in each QCA configuration found a mix of countries, instead of a dominance of NGOs from one or two countries in specific configurations. Future research based on larger, representative samples is required to confirm the findings and to investigate possible national differences in the factors that are linked to NGO involvement in co-creation activities with governments.

The relationship between NGOs and governments is also likely to be influenced by the dominant operational governance paradigm with different emphasis on the role of civil society: traditional public administration (PA), new public management (NPM) and new public governance (NPG) (Brock, 2020). A high degree of NGO/government collaboration could be an indication of a predomination of the NPG paradigm in which civil actors are encouraged to engage in the co-creation of public services. However, we don't know to what degree the NPG has been implemented in different countries. In addition, modes of governance could also vary by policy area, for instance between government organizations responsible for the judiciary or education, or by the type of service provided to residents (Røiseland, 2023). Consequently, it is still possible that the use of New Public Governance methods such as co-creation could be limited to specific innovation projects within a dominant New Public Management or Public Administration governance regime.

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Appendix A:

Outcome:

The outcome condition investigated in the QCA is an aggregated variable of the indicators measuring if the four participatory co-creation types are used. The crossover point for the QCA is between two and three methods. Meaning that high levels of co-creation is use of three or four methods. 42 of the 45 NGO that contributed to public service innovation have reported on which methods they used which means that the QCA include these 42 NGOs.

Co-creation*	Freq.	Percent	Calibration	Set membership
0 methods	1	2.38	0	Fully out
1 method	9	21.43	0.14	Mostly out
2 methods	11	26.19	0.43	More out than in
3 methods	7	16.67	0.70	More in than out
4 methods	14	33.33	1	Fully in
Total	42	100.00		

* High level of NGO participation in co-creation activities with government during service innovation development

Calibration of conditions:

Service innovation*	Freq.	Percent	Calibration	Set membership
0 innovations	3	7.14	0	Fully out
1 type	10	23.81	0.29	More out than in
2 types	10	23.81	0.57	More in than out
3 types	11	26.19	0.77	
4 types	2	4.76	0.88	
5 types	1	2.38	0.92	
6 types	1	2.38	0.94	
7 types	3	7.14	0.97	
8 types	1	2.38	0.99	
Total	42	100.00	1	Fully in

*The NGOs experience with developing service innovation is calibrated on the full sample while only those who contribute to public service innovations are shown here.

External reasons	Freq.	Percent	Calibration	Set membership
0	8	19.05	0	Less important
1 high level of importance	34	80.95	1	Important
Total	42	100.00		

Learning as a reason	Freq.	Percent	Calibration	Set membership
0	22	52.38	0	Less important
1 high level of importance	20	47.62	1	Important
Total	42	100.00		

Internal reasons	Freq.	Percent	Calibration	Set membership
0	23	54.76	0	Less important
1 high level of importance	19	45.26	1	Important
Total	42	100.00		

Funding	Freq.	Percent	Calibration	Set membership
0	24	57.14	0	Not expected
1	18	42.86	1	Funding expected
Total	42	100.00		

Size of organization	Freq.	Percent	Calibration	Set membership
1	1	2.50	0	Fully out
2	6	15	0.1	
3	6	15	0.27	
4	3	7.50	0.42	More out than in
5	14	35	0.6	More in than out
6	4	10	0.79	

7	5	12.50	0.92	
8	1	2.50	1	Fully in
Total	42	100.00		

Appendix B: Truth table

Truthtable:

Innovation experience	Internal benefits	External reasons	Learning opport.	Funding	NGO Size	number	High level of NGO part.	raw consist.	PRI consis
1	0	1	1	0	1	3	1	1	
1	1	1	1	0	1	2	1	1	
1	1	1	0	1	0	1	1	1	
1	0	1	1	1	0	1	1	1	
0	0	1	1	0	1	1	1	1	
1	0	1	1	1	1	1	1	0.915759	0.870341
0	0	1	0	1	1	1	1	0.863874	0.812628
0	1	1	1	1	1	1	1	0.850756	0.5274
1	0	1	0	1	0	1	1	0.832372	0.803359
1	0	0	0	0	0	2	0	0.799825	0.729299
0	1	1	1	1	0	1	0	0.792803	0.19761
1	1	1	1	1	1	4	0	0.781525	0.566279
1	1	1	1	1	0	1	0	0.767586	
1	1	1	0	0	1	1	0	0.759305	
1	0	1	0	1	1	3	0	0.73398	0.631868
0	1	1	1	0	1	1	0	0.731465	0.600272
0	0	1	0	0	0	1	0	0.712037	0.47431
1	1	0	0	1	1	1	0	0.667545	
0	0	0	0	1	1	1	0	0.609308	
1	0	1	0	0	0	4	0	0.601423	0.463477
0	0	1	0	0	1	1	0	0.598867	0.192084
0	1	1	0	0	1	2	0	0.544222	
1	1	0	0	1	0	1	0	0.486214	
0	1	1	1	0	0	1	0	0.433598	0.23371
0	1	0	1	0	0	1	0	0.203102	
1	0	0	1	0	0	1	0	0.1885	

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Increased participation and cooperation, for instance with citizens and civil society organisations, is a frequently mentioned goal in studies of public innovations. Such external relationships are seen to be an important factor in the development of public service innovation. In order to apply co-creation successfully, it is particularly important to investigate when and how the involvement of users contributes to the success of public sector innovations. However, the sparseness of outcome oriented empirical studies of co-creation in the context of public service innovations has been pointed out by several researchers.

Through the application of mainly quantitative data from a large-scale survey conducted in public administrations in six European countries and a pilot survey conducted among NGOs in six European countries, the thesis supplements empirical research in the field, which has been dominated by case studies. The findings of the thesis illustrate the value of a configurational approach for understanding co-creation in public service innovation contexts, as it shows how different user involvement methods combine with other input factors to form working pathways (configurations) to new and improved public services. The findings enhance our understanding of the conditions under which co-creation occurs and leads to successful public service innovation.

The thesis thereby contributes to a better, empirically founded understanding of co-creation in the context of public service innovation. This empirical vidence base is important in order to implement co-creation successfully. The thesis also contributes to the understanding of co-creation as a concept by applying operational measures of co-creation methods.