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Exploring Public Innovation Intermediaries

An Entrepreneurial Perspective

Master's thesis in Entrepreneurship
Supervisor: Elsebeth Holmen
June 2023



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Norwegian University of Science and Technology
Faculty of Economics and Management
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Preface

In the last two years, two out of our research trio have ventured into the dynamic world of startup creation as part of the venture creation program at The School of Entrepreneurship, at NTNU in Trondheim. This journey has unfolded a diverse palette of entrepreneurship flavors, from the ideation phase to implementation and beyond.

Initially, upon embarking on this venture journey, we were cautioned against orienting our startups towards the public sector, which was a surprising counsel, considering our backgrounds in social sciences. Being from disciplines that constantly scrutinize and seek to address society's complexities, we aspired to deploy our innovative solutions to challenges in the public sector, recognizing its inherent intricacies and diverse challenges.

This experience sparked our interest in studying public innovation intermediaries (PIIs). We see these entities as a potential bridge between public sector organizations and startups, encouraging collaboration to solve future societal problems.

We would like to give a special thanks to our supervisor, Elsebeth Holmen for her patience and guidance, and for always remaining positive and providing support at the oddest hours and times. We also thank our patient wives and girlfriends for their unwavering support.

Abstract

Pre-commercial procurement (PCP) has emerged as a powerful tool to drive innovation by bridging the gap between public demand for innovative solutions. PCP enables public entities to collaborate with external suppliers during the research and development (R&D) phase, fostering the creation of groundbreaking solutions that address societal challenges.

However, the successful implementation of PCP requires effective coordination and support from specialized entities known as public innovation intermediaries (PIIs). These intermediaries act as catalysts, facilitating the interaction between public procurers and external suppliers, while also providing valuable expertise and guidance throughout the PCP process. PIIs play a pivotal role in enhancing the outcomes of PCP initiatives and maximizing the potential for successful innovation adoption in the public sector.

Our study explores why PCP is essential in the innovation ecosystem and how PIIs contribute to its successful implementation.

First we examine the academic literature of PIIs within the context of PCP. It highlights the importance of the PCP process and its role in fostering innovation in the public sector. Based on our literature review we develop a theoretical framework consisting of three key concepts: Demand Articulation, Boundary Spanning, and Transferring of Innovation & Intellectual Property Protection.

Utilizing a mixed-method approach, we use the theoretical framework to examine four public innovation intermediaries in Europe as our cases. Through in-depth analysis, each case is examined, shedding light on both their commonalities and their unique attributes. The findings demonstrate that all four PIIs performed the three identified functions, albeit to varying extents, which were adapted to local regulations and market circumstances. Furthermore, the study identified various challenges encountered by these intermediaries, in addition to the principal empirical findings. These insights contribute to a comprehensive understanding of PIIs in the context of innovation and entrepreneurship. Lastly, we argue that public innovation intermediaries share similarities with startups, and suggest leveraging startups strategies to overcome challenges.

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1.0 - Introduction

Public procurement of products and services is a difficult market for newcomers to enter. Regulations favor the largest private suppliers who can use economies of scale to compete for the lowest prices. These structures and incentives favor high quantity production of existing products over new and innovative solutions. In relation to certain products and services, this might make sense. For established products, such as hammers or shovels, tools that have been used by people for thousands of years with little remaining room for innovation - it is rational to choose the cheapest provider as long as they meet a minimum requirement for quality.

But when it comes to the procurement of innovative solutions and cutting-edge technologies, such as digital products and services, where the landscape is constantly changing because of disruptive startups, the same procurement mechanisms act as roadblocks for innovation. This may lead to suboptimal solutions that may already be outdated by the time they reach the end user, creating a gap in the efficiency and quality of the services delivered by the public sector compared to what citizens are accustomed to from private suppliers.

Governments have long been aware of this problem, and have introduced different policies in order to address it. In the EU and EEA countries, government institutions known as public innovation intermediaries (PIIs) are currently looking to solve this problem and revolutionize the way public procurement of innovation (PPI) is conducted. They do so through crafting and leading public procurers and Pre-Commercial Procurement (PCP) challenges, aligning the different needs and mindsets of public organizations and private startups and SMEs.

The role of innovation is no longer just a general political consideration, it has become an intrinsic component of problem-solving in the public sector. While academia has shown growing interest in the ties between small-to-medium enterprises (SMEs) and the public sector, there has been less academic attention to the emergence of public innovation intermediaries. Our thesis seeks to address this void, proposing a newfound understanding of these pivotal, yet understudied, agents in the public sector innovation process.

This paper builds upon the existing academic literature on public procurement of innovation, pre-commercial procurement, and public innovation intermediaries. By examining four public

innovation intermediaries in Europe, we seek to develop an exploratory analysis, which can form the basis of further research.

We find that there are many similarities between our selected four cases, StartOff, CivTech Scotland, Startup in Residence Amsterdam, and Startup in Residence Intergov, and they share characteristics in relation to their role and functions. However, we identify three core operational differences. We also identify a set of challenges that are shared across the cases - some of which have been overcome, and some that remain to be solved.

Finally, we suggest that emerging public innovation intermediaries have many parallels to startups. By applying entrepreneurial lens to understand how public innovation intermediaries can overcome their challenges, we offer a conceptual discussion that can be built upon to expand future research.

1.1 - Objectives

Our thesis has several objectives that aim to contribute to the understanding of public innovation intermediaries (PIIs) and their roles in pre-commercial procurement processes (PCP).

Firstly, our primary goal is to provide a descriptive analysis of PIIs that work with PCP processes. Given the relatively unexplored nature of this domain within the academic sphere, we aim to identify and describe the characteristics, roles, functions, and activities of these intermediaries. We seek to shed light on the operational mechanisms of PIIs, and their contributions within the public sector innovation landscape.

Secondly, recognizing that PIIs operate within complex environments, we aim to uncover the unique challenges they face. We believe that identifying these challenges is a crucial step towards improving the effectiveness and efficiency of PIIs, and is central to our second research question.

Furthermore, beyond merely identifying these challenges, we strive to introduce a conceptual discussion about potential strategies for addressing these difficulties. We view PIIs through an entrepreneurial lens, drawing parallels between the dynamics faced by PIIs and startups. By doing so, we aim to stimulate an intellectual dialogue about potential coping strategies and solutions that could be deployed by these intermediaries.

In summary, our objectives of our exploration are twofold: To describe the PIIs that work with PCP processes and to identify the challenges they face. We seek to generate a rich understanding of these intermediaries, and spark a conceptual discussion about how to tackle their challenges, with the aim of contributing to the body of knowledge on public sector innovation. Our hope is that our findings will serve as a foundation upon which future research can build, and that the exploratory discussions and insights we present will prove useful to practitioners within this field.

1.2 - Research Questions

Two questions underpin our research. They aim to uncover the specific characteristics and challenges of these intermediaries, particularly those involved with pre-commercial procurement processes. Our exploration is intended to provide novel insights into this relatively underexplored area of innovation in the public sector. Furthermore, by identifying potential challenges, we aim to suggest practical recommendations and indicate areas for future scholarly investigation.

Our first research question examines the intrinsic characteristics of public innovation intermediaries engaged in pre-commercial procurement processes. We aim to understand:

What characterizes public innovation intermediaries that work with pre-commercial procurement processes?

In addressing this question, we will focus on the roles, functions, and activities of these entities, elucidating their operational mechanisms and contributions within the public sector innovation landscape.

Simultaneously, we acknowledge that these intermediaries may face unique challenges due to their specific context and the complex nature of PCP processes. This leads us to our second research question:

What are the challenges public innovation intermediaries that work with pre-commercial processes are facing?

By unearthing these challenges, we hope to provide insights that could foster the development of solutions or coping strategies, offering 'tips and tricks' that could potentially help these

intermediaries succeed. This process also aids us in identifying areas that require further exploration in future research, contributing to the broader academic discourse on PIIs in the public sector.

In the complex nexus of innovation, intermediaries play an integral role in catering to both demand and supply forces, bridging the gap between public sector actors with specific needs and startups with innovative solutions. This task, however, is far from simple due to the inherent complexities of both sides and the processes involved. Recognizing the dual nature of intermediaries' work, our research, for the purposes of focus and clarity, will primarily concentrate on the demand side of the equation. In other words, our exploration predominantly targets how PIIs interface with public sector entities and their demands. This scope is intended to shed light on the strategies and practices intermediaries employ to discern, articulate, and match public sector needs with appropriate innovation, while also acknowledging the constraints and challenges they may encounter in this endeavor. We believe this narrowed focus will provide valuable insights into this essential, yet intricate, aspect of public sector innovation.

1.3 - Scope

In conducting our research on Public Innovation Intermediaries (PIIs) operating in the context of Pre-Commercial Procurement (PCP), we encountered a scarcity of literature in this specific field of study. The existing literature primarily consists of empirical studies that focus on limited aspects of PIIs. To address this gap, we adopted a two-fold approach by integrating the literature streams of PIIs and PCP and identifying their intersection. This methodology is discussed in detail in Chapter 2.

Given the exploratory nature of our research and the limited availability of literature, we employed an abductive approach. Chapter 3 provides a detailed account of our research methodology, including its strengths and limitations.

Chapter 4 presents the empirical findings derived from our mixed-methods approach applied to multiple investigated cases. These findings form the basis for our subsequent analysis and discussion in Chapter 5. In this chapter, we utilize the theoretical framework developed in Chapter 2 as a lens to identify and discuss the key characteristics of public innovation

intermediaries. Moreover, we conclude Chapter 5 with a conceptual examination of how PIs can effectively address their challenges by adopting an entrepreneurial perspective.

In Chapter 6, we provide a comprehensive conclusion to our thesis by assessing our empirical findings and analysis in light of the research questions posed. Additionally, we offer implications for future research, highlighting possible avenues for further exploration in this field.

2.0 - Towards a Theoretical Framework

This chapter provides an overview of the academic literature pertaining to the roles and functions of public innovation intermediaries, in the context of pre-commercial procurement. Through this exploration, we review existing theories and models and derive the theoretical framework that underpins our analysis. Our exploration of this subject unfolds across five key sections.

In section 2.1, we review the literature on Public Procurement of Innovation (PPI), offering a broad understanding of the environment within which PCP operates. Here, we look at key theories and empirical studies in PPI, from its early stages until today, to set the stage for a more specific discussion on PCP.

In the following section 2.2, we focus on PCP, critically assessing the theories that define its practice and implementation. This part also covers debates around the effectiveness and potential of PCP as a means of stimulating innovation in public sector contexts.

Further on, in section 2.3, we look into the role of Innovation Intermediaries (IIs), explaining their functions and significance within innovation ecosystems. The discussion draws from a variety of disciplinary perspectives to provide a comprehensive understanding of these actors, what they focus on, and how we define their roles and functions.

In the fourth section, section 2.4, we explore the intersection of PIIs and PCP. By integrating insights from the previous sections, we examine how intermediaries operate within PCP, the roles they play, and their specific functions.

Finally, in chapter 2.5, we introduce our theoretical framework, which is informed by the preceding discussions. This framework guides our progression from theoretical understanding to empirical investigation, helping us explore the complex dynamics of PIIs in PCP.

2.1 - Public Procurement of Innovation (PPI)

Public Procurement of Innovation (PPI) has seen several shifts and developments over the past several decades. As we discovered during the initial literature review, the initial academic literature on public procurement emerged in the decades after the second World War. The first articles were primarily focused on government acquisition of military technologies from the defense industry (Lember et al., 2014).

The following chronological categorization provides an overview of the PPI literature's evolution. It's essential to note that research in each of these periods may contain diverse theories and viewpoints, and these are broad trends rather than strictly defined periods.

2.1.1 - Introduction to Public Procurement of Innovation

PPI has emerged as a critical policy tool in stimulating innovation and driving economic growth. This practice involves government organizations, at various levels, harnessing their purchasing power to acquire innovative goods, services, and technologies from the market. By actively engaging with the market and stimulating innovation, public procurement of innovation aims to enhance the delivery of public services, foster technological advancements, and promote economic competitiveness (OECD, 2017).

The public sector is the 'owner' of many problems and responsibilities across Europe. In order to function, the public sector must purchase, or procure, a vast variety of goods and services. This demand is driven by a constantly changing global society, with new technologies emerging and societal challenges with them.

Approximately 80% of the countries that participated in the 2015 OECD survey Survey on Strategic Innovation Procurement, covering 35 countries, expressed their endorsement for utilizing procurement as a means to drive innovation. Furthermore, around 50% of these countries have established an action plan specifically dedicated to procurement for innovation. These action plans are implemented either as part of broader strategies focused on innovation or procurement, or as independent initiatives (OECD, 2017).

Governments employ diverse measures to support procurement for innovation, with the most commonly used ones being policy instruments, regulations, and legal frameworks (OECD, 2017);

Edquist & Zabala-Iturriagoitia, 2012; Edler, 2010; Edler & Georghiou, 2007). Additionally, comprehensive programs are implemented, such as those targeting smart procurement in general or research and development (R&D) specifically. Financial instruments, including dedicated funding for procurement initiatives aimed at fostering innovation, are also utilized by some countries (OECD, 2017).

In recent years, public sector agencies across Europe have begun implementing public procurement as an integral part of innovation policy strategies. The connection between procurement and innovation is by Jakob Edler and Luke Georghiou (2007) mainly based on three distinct considerations.

First, the procurement of innovative goods or services can have a direct impact on the quality of services offered by the public sector. It can make the public apparatus more effective through improving service delivery or adding new types of services catering to citizens' needs. The often high search and purchasing costs associated with innovative solutions is often outweighed when measured against the overall cost savings and thus to overall social welfare over time (Edler & Georghiou, 2007).

Secondly, public procurement can often be an important part of 'local' demand. This affects the location decisions of industry, small to large enterprises to multinational enterprises, and makes actors more inclined to generate innovation in a given location (Edler & Georghiou, 2007). Demand articulation through public procurement can trigger innovation cycles, making the public sector responsive to new products and services produced by industry, which in turn send signals to industry that the public sector market is a constructive place in which to introduce and test innovation (Vonortas et al., 2016; Edler & Georghiou, 2007).

Third, in all open markets, there exists a range of market and system failures affecting the translation of needs into functioning markets for innovative goods and services. The public sector, through innovation procurement, can be a remedy for these market dynamics. Public sector can reduce risk of suppliers through sheer size of purchase orders, often bundled across several public institutions. This creates clear incentives for suppliers by allowing them to hit markets of economy of scale faster, reduces market risk and fosters early learning. Early uptake by the public sector sends clear signals to the private market, demonstrating function and value

creating spillover effects often more valuable than the initial purchase (Vonortas et al., 2016; Edler & Georghiou, 2007).

However, using public procurement for innovation and development is not a new phenomenon. The contemporary drive for cohesive and explicit policies builds heavily on historic, often military-related post-WWII public procurement experiences. For instance, in the United States, public procurement programs played a crucial role in creating technologies such as the Internet, global positioning systems, and the semiconductor industry, all of which have had significant economic impacts (Lember et al., 2014).

Other successful government-initiated projects leading to major innovations and positive developmental effects have been observed worldwide. For instance, Japan used public purchasing as a direct developmental policy tool in the 1960s. In Sweden, a “developmental pair” approach evolved between the state and technology companies based on technology-intensive public-procurement programs (Lember et al., 2014).

In recent years, countries such as the United States and institutions like the European Commission have begun developing explicit policies to place public procurement at the service of innovation and development. This trend has also been picked up by international organizations suggesting that both developed and developing countries introduce public procurement of innovation policies as part of their demand-side innovation policy mix (OECD, 2017; Lember et al., 2014).

2.1.1.1 - 1950s - 1970s Inception and Growth

Employing public procurement as a tool for innovation and development is not a recent concept. The current momentum towards developing unified and explicit policies has deep roots in historical experiences, predominantly post-WWII, where public procurement often had military implications. The earliest literature in public procurement of innovation revolved around the concepts of government procurement and its role in stimulating technological innovation, particularly in defense and space industries. These decades marked the inception and initial growth of PPI literature, focusing on large-scale government initiatives like the NASA Apollo program in the United States. Notably, the United States stands out as an example where public procurement initiatives were instrumental in the genesis of influential technologies such as the Internet, GPS, and the semiconductor industry, each of which has had profound economic

implications (Lember et al., 2014). The emphasis was predominantly on the demand-side perspective with governments acting as the primary drivers of innovation. The nature of these initiatives required large amounts of confidentiality, capital and research, resulting in a small number of big companies competing for large contracts, from the defense industry to energy and communications technology (Rothwell & Zegveld, 1981).

The early works on public procurement of innovation laid the foundation for subsequent research and policy discussions. During this period, scholars and policymakers recognized the potential of procurement as a driver for innovation. Key themes explored include the role of demand-side policies; Researchers began examining the concept of using public demand to influence innovation. Discussions focused on the government's ability to create market pull, encouraging businesses to invest in research and development (R&D) activities.

Demand-side policies

The earliest articles pertaining to innovation in public procurement primarily revolve around the procurement processes within the defense sector (Moore, 1964; Arrow, 1962). These articles research the arms race between the United States and the Soviet Union during the Cold War, exploring the defense industry's capacity to produce novel fighter aircraft, as well as information and communication systems (Schmookler, 1966; Moore, 1964; Arrow, 1962). This technological race resulted in several breakthroughs that have found applications in civilian domains, exemplified by the Internet and GPS systems. The articles emphasize the demand of public authorities for innovative military technology and the ability of private entities to supply these products. This marks the inception of a protracted academic discourse encompassing the interplay between demand-side requirements and the supply-side capability to deliver, acting as catalysts for innovative products and services. Jacob Schmookler (2013) contended that the conditions on the demand side bear significant importance in assessing the desirability and feasibility of innovation, as a company's perception of anticipated profits from new product development constitutes a pivotal determinant in the decision to innovate, thereby charting the course of firms' innovative pursuits.

The paper "*Government policies towards industrial innovation: a review.*" published in 1976 by Pavitt and Walker, provides a review of government policies that aim to support industrial innovation, specifically highlighting "the encouragement of technically progressive procurement

practices" as one of these policies (Pavitt and Walker, 1976). This paper sets the stage for subsequent studies that focus on the role of government demand in driving industrial innovation and technological advancements.

2.1.1.2 - 1980s - 1990s Expansion and Diversification

As governments began to see the potential for procurement to drive innovation in a broader range of sectors, the literature likely expanded to cover these new areas. The role of small and medium enterprises (SMEs) began to get more attention. The focus still remained largely on the demand side, but the supply-side perspective began to emerge, as the literature started discussing how companies could leverage public procurement to innovate.

Rothwell and Zegveld (1981) discusses procurement as a potential government action to stimulate innovation within the economy, particularly in response to the global economic crisis that emerged following the 1973 oil price shock. Nelson and Langlois (1983) further explore government innovation policies, including procurement, in six industries, evaluating their effectiveness. Hutton and Hartley (1985) examine the impact of procurement policy on research and development (R&D) in the UK's medical equipment industry, finding a positive influence of procurement by the National Health Service on the research activities of British medical equipment manufacturers. Additionally, Mowery and Langlois (1996) investigate the contribution of the US government, particularly the Department of Defense's procurement practices, to the development of the software industry.

In a similar vein, subsequent studies during this period contribute to our understanding of the public procurement of innovation. For example, Pavitt and Walker (1976) explores the link between government procurement and technological innovation in the electronics industry. They emphasized the potential of procurement policies to shape technological trajectories and encourage collaboration between government and industry actors. Moreover, James Cypher (1987) analyzed the impact of defense procurement on technological innovation in the aircraft industry, highlighting the role of public demand in driving advancements and promoting cooperation between firms. These studies collectively demonstrate the growing recognition of the government's role in stimulating innovation through procurement practices during the 1970s to 1990s, laying the foundation for further research and policy development in the field of PPI.

System of Innovation (SI) Approach

The emergence of the system of innovation concept in the 1990's gained rapid interest of European policymakers (Chaminade & Edquist, 2012). The concept of "system of innovation" originates from innovation policy theory and refers to the interconnected network of actors, institutions, organizations, and processes that collectively contribute to innovation within a specific socio-economic context. It recognizes that innovation is not solely the result of individual actors or organizations but emerges from the complex interactions and relationships among various stakeholders (Edler, 2010).

In a system of innovation, key actors include not only firms and entrepreneurs but also universities, research institutions, government agencies, investors, consumers, and other supporting organizations. These actors interact and collaborate through various channels, such as knowledge exchange, technology transfer, funding mechanisms, and policy initiatives, to generate, diffuse, and apply new knowledge, technologies, and practices (Edler, 2010). The SI approach indicates that policy makers should intervene where there are systematic failures in the system (Chaminade & Edquist, 2012)

The system of innovation perspective emphasizes the importance of both technological and non-technological factors in driving innovation. It recognizes that innovation is not limited to scientific research and technological advancements but also encompasses organizational, institutional, and social changes. It highlights the role of factors such as education and skills development, intellectual property rights, market dynamics, regulatory frameworks, and cultural norms in shaping the innovation process (Edler, 2010).

Understanding the system of innovation helps policymakers and researchers analyze and design effective innovation policies and strategies. By considering the interactions and dynamics within the innovation ecosystem, policymakers can identify bottlenecks, leverage strengths, and implement interventions that foster a conducive environment for innovation, entrepreneurship, and economic growth (Chaminade & Edquist, 2012).

2.1.1.3 - the 2010s - 2021 Balancing Demand and Supply Perspectives and Role of Intermediaries

The most recent PPI literature has started to balance the demand and supply perspectives, recognizing the need for both to work together to maximize innovation. The role of innovation intermediaries also emerged as a significant theme. These intermediaries act as bridges between public sector bodies and innovative companies, facilitating the exchange of information and ideas. The literature also started discussing issues like intellectual property rights and the balance between competition and collaboration.

Innovation Policy

There has been a resurgence of interest in utilizing public procurement as a means to stimulate innovation, along with a broader focus on demand- and supply-side innovation policies. This renewed interest stems from the perception that traditional approaches primarily focused on either the supply-side or demand have not effectively enhanced innovation performance. The recognition of this relative failure has prompted a reevaluation and increased attention towards an interlinked perspective (Uyarra et al., 2014; OECD, 2011; Edler, 2010;).

SME and Demand Policy

Notably, the work of K. DeGhetto, T. Sutton, and M. L. Zorn in their 2018 study, "Institutional Drivers of Born-Public Ventures", sheds light on the institutional drivers that can facilitate innovation in startups and young companies. They emphasize the importance of institutional factors, such as supportive government policies, regulatory frameworks, and funding mechanisms, in creating an enabling environment for innovative ventures to thrive in the public procurement landscape. This study underscores the significance of policy interventions as catalysts for driving innovation and entrepreneurial activities within the PPI domain (DeGhetto et al., 2018).

In the paper 'Fostering SME supplier-enabled innovation in the supply chain: The role of innovation policy' (Selviaridis & Spring, 2022), the authors analyze how innovation policy influences innovation among small to medium-sized companies within the supply chain. Their discussion aligns with DeGhetto et al. in emphasizing the importance of public institutions as rule setters in shaping innovation outcomes. They argue that innovation policy is implemented

either to stimulate innovation or to overcome challenges related to public institution failures. Selviaridis and Spring investigate these challenges, attempting to reveal whether innovation policy can be leveraged to strengthen interactions between procurement organizations and small to medium-sized companies (Selviaridis & Spring, 2022). They present the following assertion, derived from their research: The intervention of regulatory institutions in shaping procurement rules for market-ready innovation, and aiding SMEs in adapting to the rules and norms of procurement organizations, is positively associated with a higher degree of SME innovation adoption within organizations (Selviaridis & Spring, 2022).

Building on the concept of catering institutional legislation to the dynamic needs of startups and small and medium-sized enterprises (SMEs), Akenroye et al. (2020) conducted a study titled "Dynamic Capabilities for SME Participation in Public Procurement." Their research emphasizes the importance of aligning institutional regulations with the evolving requirements of startups and SMEs, which often face unique challenges and resource constraints. The authors advocate for flexible and adaptive institutional frameworks that can accommodate the specific characteristics and dynamic capabilities of these smaller entities. This study aligns with the growing recognition of the role of policy in promoting SME participation in public procurement and acknowledges the need for tailored approaches to enhance their involvement and success in this domain.

Supporting the importance of policy interventions in PPI, Di Mauro, C., Ancarani, A., and Hartley, T. conducted a study in 2020 titled "Unraveling SMEs' Participation and Success in Public Procurement." Their research highlights the role of policy instruments, such as simplification of administrative processes, reducing barriers to entry, and fostering collaboration between SMEs and public entities, in enabling SMEs to engage effectively in public procurement. This study reinforces the notion that well-designed policies can play a crucial role in overcoming the challenges faced by SMEs and unlocking their potential to contribute to innovation and economic growth through PPI.

Overall, these studies collectively emphasize the growing recognition of policy as a crucial tool for promoting efficient and innovative practices within the realm of public procurement of innovation. They underscore the need for institutions to adapt and cater to the unique characteristics and dynamic capabilities of startups and SMEs, acknowledging their vital role in driving innovation and economic development. By adopting supportive policies and regulatory

frameworks, governments can foster an environment that encourages and facilitates the participation of these entities in public procurement processes, ultimately enhancing overall innovation outcomes.

Different types of PPI

In the context of public procurement of innovation Edquist and Zabala-Iturriagoitia (2012) identifies two distinct dimensions. The first dimension pertains to the relationship between the procuring organization and the end user of the procured product. *Direct PPI* occurs when the procuring organization is also the end user of the product. In this case, the procuring agency utilizes its own demand or need to stimulate innovation. While the primary purpose is to meet the specific needs of the agency, the resulting product often finds utility among other users as well, benefiting both the procuring agency and society at large (Edquist & Zabala-Iturriagoitia, 2012). On the other hand, *catalytic PPI* involves the procuring agency acting as a catalyst and technical resource for the benefit of end-users. The needs addressed through catalytic PPI are external to the public agency, as it seeks to procure new products on behalf of other actors. The objective here is to facilitate the development of innovations that can be utilized by the broader public rather than solely supporting the mission of the procuring agency (Edquist & Zabala-Iturriagoitia, 2012).

The second dimension focuses on the nature of the resulting product in terms of the embedded innovation. Three types of procurement outcomes can be distinguished: pre-commercial, adaptive, and developmental procurement. Pre-commercial procurement (PCP) involves the procurement of expected research results and entails direct public investment in research and development (R&D) without actual product development. It does not entail the purchase of a non-existing product, and therefore, no buyer for such a product is involved. This type of procurement is also referred to as "contract" research and may encompass the development of a product prototype (Edquist & Zabala-Iturriagoitia, 2012).

Adaptive PPI occurs when the procured product or system is incremental and new only within the country or region of procurement. Consequently, innovation is required to adapt the product to specific national or local conditions. It is also labeled as a "diffusion-oriented" or "absorption-oriented" PPI. Lastly, developmental PPI involves the creation of entirely

new-to-the-world products and/or systems as a result of the procurement process. It can be seen as "creation-oriented" PPI and involves radical innovation.

To further explore the public procurement of innovation, this thesis will take a closer look at the specific case of pre-commercial procurement. PCP plays a crucial role in fostering innovation through public R&D investments and holds the potential to generate valuable research results and prototypes. By examining the characteristics, challenges, and outcomes of PCP initiatives, this thesis aims to contribute to a comprehensive understanding of how PCP can effectively support the public procurement of innovation and drive societal progress.

2.2 - Pre-Commercial Procurement

2.2.1 - Overview

As we move forward in our theoretical exploration, the upcoming section is dedicated to a concept central to our research: Pre-commercial procurement. This procurement strategy has been increasingly recognized for its potential to spur innovation, yet it remains relatively underexplored in the academic literature. In our pursuit to uncover the nuances of public innovation intermediaries, understanding PCP is vital.

PCP serves as a bridge connecting the public sector's demand for innovative solutions and the supply-side's capabilities to fulfill this demand. However, it presents a unique set of dynamics that set it apart from traditional procurement methods. By exploring PCP, we will shed light on its distinctive characteristics, the principles it operates upon, and its potential to drive public sector innovation.

In this section, we will delve into existing literature to provide a comprehensive understanding of PCP. We will dissect its core mechanisms, its role in fostering innovation, and its relationship with PIIs. Through this investigation, we aim to establish a robust theoretical foundation that will inform our empirical analysis and enable us to address our research questions more effectively.

2.2.2 - PCP in the Literature

Dujčák et. al. (2014) discuss PCP as an effective tool for supporting innovation in the public sector. In the EU, PCP has been discussed as an approach that fosters collaboration between the public and private sectors in developing innovative solutions. These solutions aim to address socio-economic issues, respond to challenges, or public concerns, particularly when no existing solution can be found on the market that can be obtained through traditional procurement instruments such as PPI (Dujčák et. al., 2014; Lember et al., 2014; Commission of the European Communities, 2007).

Dujčák et. al. discusses PCP as a new phase preceding commercial procurement which incorporates research & development (R&D) into the procurement process. Key characteristics of this approach, especially within the R&D domain, include the decoupling of primary production (eg. prototyping or piloting) from mass production, risk and benefit sharing, and competitive-based supplier selection in each phase. PCP can invigorate innovation, escalate investment levels, and lessen risks via co-financing. Co-financing is utilized for high-risk investment projects, which are associated with the uncertain predictability of R&D outcomes. PCP can be a viable solution to the long-standing disconnect between the private sector, which focuses on R&D, and the public sector, which typically acts as a purchaser of new technologies (Dujčák et al., 2014).

The PCP concept aims to propel technological innovation from the demand side by sharing the risks and benefits of R&D between a single buyer and multiple independent providers. Each provider is awarded a separate contract for activities such as solution exploration and design, prototyping, and/or the production of a limited quantity of initial products or services in the form of a test (or pilot) series. This necessitates a multi-stage selection process, often followed by a public procurement of innovation , where the developed solution is being commercialized. Dujčák et. al. (2014) adds a ‘Phase 0’ to the PCP concept which encompasses the need to conduct creative research before a PCP process is initiated, as illustrated in figure 01:

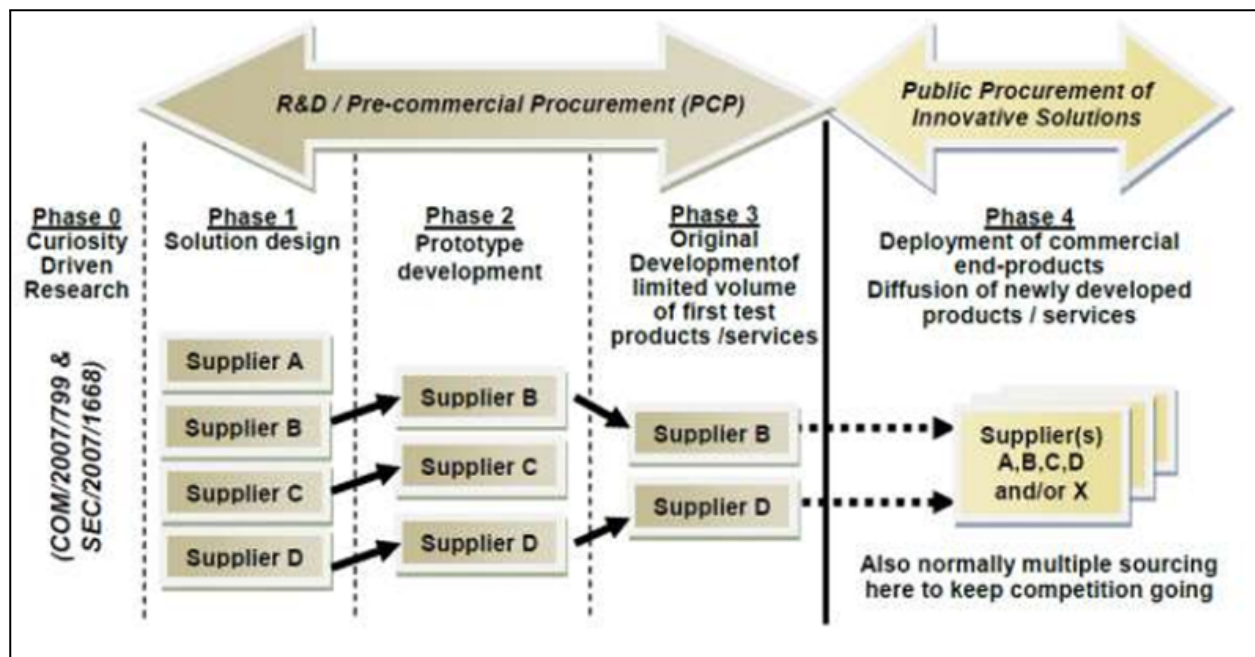


Figure 01: Different phases of PCP process (Dujčák et al., 2014, 284)

The PCP process

The significance of citizen participation in governmental decision-making has been validated by Concilio & Molinari (2011). However, observations by organizations such as the OECD and the European Commission have revealed that most public institutions fail to meet citizens' needs when procuring new solutions, as cited by Carstensen & Bason (2012).

From this perspective, the implementation of the PCP approach appears to be a potential solution to this issue. PCP not only promotes the public good but also contributes to the creation of public value, as suggested by Bland et al. (2010). This highlights the role of PCP in enhancing public-sector procurement processes by better aligning them with citizens' needs and expectations.

Iossa et al. (2017) explore various instruments used for procuring innovation within the public sector, with a specific focus on PCP, Procurement of Innovative Solutions (PIS), and Innovation Partnerships. They scrutinize how these instruments impact firms' drive for innovation, considering various factors such as: (i) synergies and externalities between R&D and large-scale production, (ii) the uniqueness of the innovation, (iii) the role and presence of Small and

Medium Enterprises (SMEs) in the market, and (iv) the risk of supplier lock-in and market foreclosure. Their research expands the discourse on demand-side innovation policies by examining the contractual aspects and providing significant insights for both academics and policy-makers (Ioassa et al., 2017).

Iossa et al. (2017) argue that using contractual rights as a reward for valuable innovations can potentially harness economies of scope, enhance research efforts, decrease commercial risks, and facilitate financial accessibility. Yet, they also caution that this can create market monopolies, facilitate situations that may disadvantage new entrants and SMEs, and increase the chances of persevering with low-value projects. Therefore, they suggest that whether the bundling of the two stages of the innovation process (R&D stage and large-scale production/commercialisation stage) is optimal or not depends on several factors. These include the presence of economies of scope or positive externalities between R&D and production, the degree of specificity of the innovation, the role of SMEs in the market, the level of potential market competition, the risk of market foreclosure, the possibility of setting clear performance targets, and the competency and efficiency of the procuring organization (Ioassa et al., 2017).

Relevance of PCP

So why is PCP relevant for our thesis? PCP is a competitive method of public procurement where public authorities stimulate innovation by sharing the risks and benefits of the design, prototyping, and testing of new products and services with businesses.

PCP fits well with the dual focus on supply and demand. On the demand side, public authorities identify their needs that are not met by currently available solutions in the market. They use PCP to stimulate the supply side (private sector companies) to invest in research and development to create innovative solutions for these needs.

From the supplier perspective, PCP offers a unique opportunity to understand specific public sector needs and develop tailored solutions. Given the significant market that the public sector represents, successful engagement in PCP can open up new business opportunities for suppliers.

Innovation intermediaries play a key role in the PCP process, especially in bridging the gap between public authorities and suppliers (Ioassa et al., 2017). They help articulate the needs of

public authorities and translate these needs into terms that suppliers can understand and respond to. They also help suppliers navigate the PCP process and can support them in their R&D efforts.

Intermediaries also have a role to play in the later stages of PCP when prototypes are tested and validated. They can facilitate the testing process and help manage the relationship between public authorities and suppliers during this phase. Moreover, they can assist in transferring the successful innovations into the operational environment of the public sector.

2.3 - Innovation Intermediaries (II)

In this section we will look at how the literature discusses the concept of innovation intermediaries. First, in section 2.3.1, we begin with a general discussion on innovation intermediaries, before looking at how the literature defines roles, function, and activities of innovation intermediaries in chapter 2.3.2. Having a clear understanding of these concepts will allow us to look at characteristics of the innovation intermediaries. Finally, in chapter 2.3.3 we discuss public innovation intermediaries specifically which is our main scope of innovation intermediaries.

2.3.1 - Overview

Any third party firm, organization, or a person that acts as a mediator and offers intermediation services for two or more parties can be called an intermediary. Intermediary is a broad term that could be used to identify a set of actors such as private organizations, individuals, experts or advisors in the form of retailers, distributors, wholesalers, field experts, consultants, platforms, media companies, agencies and financial institutions (Howells, 2006). Intermediaries are found in various fields offering different types of intermediary services. For example, various actors in between producer and end user in a sales process are intermediaries according to the definition. For the purpose of this study, we term those third-party actors engaged in promoting and facilitating innovation related activities as innovation intermediaries. Thus we eliminate actors involved in sales, marketing, and distribution channels, without directly contributing to any sort of innovation.

Innovation intermediaries (IIs.) are identified as external organizations or individuals that assist one or more parties in their innovative activities by developing, gathering, processing,

validating, controlling and disseminating external knowledge; while providing various resources, building links and regulating the innovation networks, eco-system creation and orchestration; as well as engaging in policy formation and upgrade when necessary (van Welie et al., 2020; Landoni, 2017; Bakici et al., 2013; Stewart & Hyysalo, 2008; Howells 2006). In addition to promoting innovation diffusion, and disrupting existing systems, they also support the creation of new innovation systems including sometimes orchestrating innovation eco-systems (Kivimaa et al., 2019a, 2019b; Klerkx & Leeuwis, 2009). IIs are found to be engaged in several different ways. Some IIs represent one side of the transaction (agent role), while some others are found representing both sides of a transaction (broker role) (Chesbrough, 2006).

The heterogeneous roles played by actors categorized under the term ‘IIs’ (the heterogeneity of the roles is further discussed in section 2.3.2) makes it difficult to provide a definition (Feser, 2022). Therefore, the existing literature has so far failed to provide a generally accepted definition, which has led to the inclusion of entities, whose primary role may often not be as an intermediary (Feser, 2022; Howells, 2006).

Due to the difficulty of finding a proper definition, we resorted to using the definition provided by Howells (2006) which was later used by several authors (Feser, 2022). Howell’s (2006) defines IIs as “An organization or body that acts as an agent or broker in any aspect of the innovation process between two or more parties. Such intermediary activities include: helping to provide information about potential collaborators; brokering a transaction between two or more parties; acting as a mediator, or go-between bodies or organizations that are already collaborating; and helping find advice, funding and support for the innovation outcomes of such collaborations.”

In section 2.3.2 we will discuss the different types of IIs, their roles, functions and activities in the innovation processes.

2.3.2 - Types, Roles, Functions and Activities of Innovation Intermediaries

According to our own observation in reviewing existing literature - also confirmed by several other authors usually by means of systematic literature reviews (eg. Caloffi et al., 2023), there is no proper taxonomy available classifying the IIs. The term ‘innovation intermediary’ or similar is used to identify any third-party who is working in between the major actors of innovation creation and diffusion. Similarly, roles and functions of intermediaries are used ambiguously in

literature by different authors, sometimes the terms are used interchangeably (Caloffi et al., 2023). In this section, we provide an overview of types of IIs and the functions they perform.

2.3.2.1 - Types of Innovation Intermediaries

In the current literature, the identification and classification of IIs remains ambiguous, with considerable variance in definitions and operational descriptions (Caloffi et al., 2023). The heterogeneity in literature arises mainly due to the definition, where any third-party entity that positions itself between the key actors involved in the initiation and propagation of innovation are considered as IIs. In their systematic literature review examining over 1400 articles published in 558 scientific journals Caloffi et al. (2023), discovered two additional contributors to the ambiguity, not only in the types of or taxonomy of IIs, but also on other terms related such as ‘Roles’, ‘Functions’ and ‘Activities’.

First, there are diverse approaches to identify IIs from multiple perspectives, using various terms such as innovation brokers, matchmakers, boundary spanners. The focus of the literature were found often on the different types of organizations including, among others, (a) knowledge-intensive business service providers (KIBS), (b) research and technology transfer organizations/agencies (RTOs), (c) science parks and incubators, (d) virtual platforms such as crowdsourcing platforms. This heterogeneity makes it difficult to identify patterns, for example in terms of the key intermediary types and their pivotal functions. (Caloffi et al., 2023; Prodi et al., 2022; Duan & Jin, 2022; De Silva et al., 2018; Miller, 2014; Goddard et al., 2012; Intarakumnerd, 2011)

Second, as IIs have gained popularity, their demand also increased leading to more diverse and newer types where some are specialized in specific activities or sectors. These include IIs that deal with new digital technologies such as IoT (Rossi et al., 2022), which are systemic and complex in nature, and which require the involvement of actors who are able to coordinate and manage these multi-party systems (Rossi et al., 2022). Moreover, the need to invest in sustainability has led to the creation of intermediaries that support sustainable transitions (Kivimaa et al., 2019b; Polzin et al., 2016). The continuous addition of new types of intermediaries makes it further difficult to identify their common traits and differences and provide a solid taxonomy (Caloffi et al., 2023).

In their work, Caloffi et al. (2023) have attempted to provide a taxonomy for IIs. This taxonomy provided in *table 01* classifies IIs into six types, along with their intended main functions and activities related to the type and functions:

- a). ***Incubators***: Incubators support the creation and sustenance of start-ups. Some incubators focus on a specific industry such as emerging high-tech sectors (Caloffi et al., 2023).
- b). ***Innovation system intermediaries*** (Science parks, technology parks, TTO's providers of advisory services): These intermediaries have at least a partial public mandate. They may be established to address specific system failures which are not attractive to the private sector alone (Intarakumnerd & Chaoroenporn, 2013; Russo et al., 2018).
- c). ***Open IIs*** (eg. innovation centers): These facilitate open innovation processes among firms, other organizations (eg. not-for-profit organizations) or individuals whilst operating across different industries (Caloffi et al., 2023).
- d). ***Transition intermediaries*** (Many intermediaries can be in this type, including digital platforms): These intermediaries play a role of breaking and mending rules and practices of an existing system, to promote change in firms, public administration or other organizations, and in the society as a whole. These intermediaries can facilitate societal transitions toward greater sustainability by coordinating activities and processes at different scales and phases (van Welie et al., 2020; Kivimaa et al., 2019a; Bakici et al., 2013).
- e). ***Knowledge Intensive Business Service providers (KIBS)***: KIBS offer a wide range of knowledge-intensive services, such as the provision of knowledge and technology check-ups, market analysis, matchmaking, and linking with funding sources (Caloffi et al., 2023; Landoni, 2017). KIBS are usually capable of identifying potentially useful knowledge and effectively communicating it to recipients (Howells , 2002). In addition to this function, they also perform that of relationship managers (Paul & Whittam, 2010) as the transfer of knowledge does not occur smoothly when it is not supported by collaborative relationships (Corvello et al , 2023)

f). **Cluster Intermediaries** (science parks and incubators and others that work as a cluster): Intermediary clusters are either based on a geographical area or a certain technology or an industry. The efficiency of the clusters depend on their ability to enable member firms to build relationships with external organizations (Caloffi et al., 2023) .

A taxonomy for Innovation Intermediaries

Finally, we would like to state that extant literature has not provided a sound taxonomy for intermediaries. Therefore, we have used the work of Caloffi et. al (2023) which is provided in *table 01*. This taxonomy is the most recent one, and seems to cover a high percentage of articles in the II literature. However it is not perfect. For example, the public innovation intermediaries working with pre-commercial procurement, which is our unit of analysis, cannot be easily placed under a type provided by the taxonomy. Also, the taxonomy is lacking on the different roles performed by the IIs. Further, although they have attempted to provide functions and activities of IIs, some key functions such as demand articulation, and boundary spanning are missing in the provided taxonomy. The authors themselves stated such limitations;

“We excluded from our database search results for articles using some of the terms (eg. gatekeeper) mentioned by Howells (2006) as possible labels used to indicate IIs, because they lacked clarity and consistency. A word like gatekeeper combined with innovation can be found in papers referring to very different topics, not necessarily to IIs. At the same time, there may be papers that do in fact talk about intermediaries but are not included in this literature review”

(Caloffi et al., 2023).

Table 01: Types of innovation intermediaries

Type	Private/Public	Functions	Activities
Incubators	Public, private, and mixed	Incubate new firms; Support innovation in firms	<ul style="list-style-type: none"> ● Incubate new firms / support entrepreneurship in new industries / enhance skills ● Organize events to stimulate creativity and networking ● Create networks between businesses and venture capitalists
Innovation system intermediaries (Science parks, TTO's providers of advisory services)	Mainly public or mixed public-private	Support innovation and technology transfer	<ul style="list-style-type: none"> ● Support university-industry & other types of R&D projects ● Incubate new firms/ support entrepreneurship in new industries ● Perform knowledge and technology check-ups to firms (SMEs in particular) ● Develop technological leadership, also aimed at attracting innovative companies ● Manage knowledge across boundaries
Open IIs (eg. innovation centers)	Public, private, and mixed	Support open innovation processes	<ul style="list-style-type: none"> ● Support interfirm networks ● Scout ideas and connect people/organizations who can collaborate in their development ● Create and manage interfaces between different sectors of the same organization ● Create and manage open platforms or other tools that allow and motivate open participation
Transition intermediaries (Many intermediaries can be in this type, including digital platforms)	Mainly public (except for commercial digital platforms), and mainly private for commercial digital platforms.	Promote transitions towards environmental sustainability; Promote institutional change in society; Promote organizational change in firms, public administration and other organizations	<ul style="list-style-type: none"> ● Diffuse information and promote networks to facilitate political change ● Promote interdisciplinarity in research projects ● Promote the transition to new governance systems ● Include various components of a constituency in an open debate ● Promote changes in the system of norms and standards towards sustainability ● Translate theoretical research into applied projects ● Manage knowledge across boundaries
KIBS	Public, Private, and mixed	Support innovation in firms	<ul style="list-style-type: none"> ● Perform knowledge and technology check-ups ● Perform technology and sector forecast analysis ● Monitor possible sources of funding ● Help companies to identify possible business partners
Cluster Intermediaries (those who work as a cluster)	Public, Private	Support innovation and competitiveness in firms	<ul style="list-style-type: none"> ● Create networks among local (regional/cluster) agents ● Bring external knowledge and technologies into the cluster ● Promote R&D collaboration projects ● Provide other knowledge-intensive services to local firms (SMEs in particular)

(Caloffi et al., 2023)

Our objective in this section was to provide an overview to the heterogeneous types of actors that are discussed under the term innovation intermediaries. The taxonomy, which is the result of a very recent publication (April, 2023) is the, to the best of our knowledge, the only one available. However, due to limitations discussed above and the unavailability of a complete taxonomy in the literature, we will further cease to discuss the various types of IIs, and focus on other aspects such as roles, functions and activities from the next section onwards.

2.3.2.2 - Roles, Functions, and Activities

The generic definitions used in the literature provide only limited insights into the heterogeneous landscape of innovation intermediaries and their diverse roles, functions, and activities. The present discussion is based on a broad conceptualization, focusing on the multifaceted functions that these intermediaries perform, while acknowledging the existence of varying interpretations.

Further contributing to the conceptual complexity, the roles and functions of IIs are often used interchangeably in literature, reflecting a lack of consensus regarding their distinctiveness or mutual exclusivity. Similarly, the terms functions and activities are found used interchangeably. While acknowledging the potential interpretative fluidity between roles and functions (and also between functions and activities), this section will first provide some insights from the literature on the various roles performed by the IIs, and then move on to primarily emphasize the functional aspects of IIs, given their overarching importance in shaping the innovation landscape. The complex interplay between roles, functions, and activities, and their susceptibility to contextual variation, might justify such a focus at this juncture.

Roles performed by Innovation Intermediaries

According to Howells (2006), IIs perform one or more of four roles: (a) management of innovation, (b) networking and bridging systems, (c) organization of intermediary services, and (d) diffusion and technology transfer. Furthermore, Klerkx and Leeuwis (2009) identified three roles of intermediaries namely, (a) demand articulation; where the demand side and supply side are connected, (b) network formation, and (c) innovation process management. Due to their ability to collaborate with several parties, IIs are also found playing the role of

eco-system orchestrator, where the main role of IIs is to link different stakeholders with complementary objectives, interests, and skills in supporting the generation and diffusion of innovation' (De Silva et al., 2018; Edler and Yeow, 2016). With sufficient capabilities and funding, IIs could take the initiative to lead the industry and the innovation ecosystem (Intarakumnerd and Chaoroenporn, 2013).

Meanwhile, De Silva (2022), states that IIs perform two major roles, namely, knowledge integration and network building, where the former is aligned with exploratory innovation while the latter contributes to the exploitative innovation. and these have a differential impact on assisting innovation. (De Silva, 2022)

However, the roles (and also functions) of different IIs vary depending on the industry they are operating in as well as depending on the parties with whom they are collaborating. For example, IIs facilitate collaboration between universities, research institutes and industry (Shohet & Prevezer, 1996), private or public organizations and user communities (e.g. Randhawa et al., 2018), entrepreneurs and adopters and between different industries (e.g. Gassmann et al., 2011), and the role played in various instances also differ.

In the next section, we will discuss different functions played by IIs. However, aligning with clear focus to scope of our research and also due to the heterogeneity across extant literature, we do not attempt to map the functions to different roles. We also do not distinguish between functions and activities in this review section.

Typical functions performed by Innovation Intermediaries

Howell's (2006) stated ten different functions carried out by IIs whilst assisting the innovation process, irrespective of its legal and organizational form: (1) foresighting and diagnosing of innovative and technological trends, (2) scanning and information processing during the innovation process, (3) knowledge production such as combining or recombining of knowledge, (4) gatekeeper and broker roles in ecosystems, (5) testing and validating of innovation, (6) accrediting for innovation, (7) validating and regulating, (8) protecting innovative business models' services and products, (9) commercializing innovation (10) and evaluating the results of innovation cooperation.

According to several authors, IIs are involved in functions such as networking, deal-making, and information diffusion, using diverse means such as planned introductions and meetings, organization of various kinds of events, and the provision of interaction spaces (Rossi & Russo, 2010; Acworth, 2008; Etzkowitz and Leydesdorff, 1998) IIs also assist firms to enhance capabilities by providing training (in the use of specific technologies or in general management practices or skill upgrading) or knowledge-intensive services (such as support for patent search and patent licensing, testing and certification), or by intermediating the provision of services that are able to support firm competences (Bessant & Rush, 1995).

Authors, who have attempted to study specifically on the functions carried out by IIs have provided various sets of functions under IIs. In Appendix 1, we present the work of Ng et. al (2022) who provides an overview of such functions collected from different empirical and review literature.

IIs have the special capability to assist collaborative innovation. They can not only connect different parties together, but also can coordinate collaborative innovation processes themselves; they can do so because they have assimilated knowledge in various fields and are able to bridge these diverse knowledge and competencies to aid cross-pollination of knowledge (Colovic, 2019). Strength of IIs is the ability to bring together actors from different backgrounds who are usually cognitively distant to adequately learn together (Nooteboom, 2000), or who have different perspectives, cultures, norms, values and incentives and are less likely to initiate collaborative innovation by themselves (Klerkx and Leeuwis, 2009).

2.3.2.3 - Summary of Innovation Intermediaries

Despite the diverse definitions found in literature, we have provided a definition to the IIs, and then moved on to introduce different types of IIs. Then we discussed the typical roles and functions performed by IIs.

The roles, functions (and activities) discussed above are particularly important for small and medium-sized enterprises (SMEs) and start-ups, who often lack the resources to acquire critical knowledge, competencies or technologies, or the ability to successfully convert those into products and services. IIs can help such firms to gain awareness, knowledge, and competence the firms need, in order to find the most appropriate way to accomplish it.

In section 2.3.3 we will discuss the public innovation intermediaries, and special functions they play in the innovation systems.

2.3.3 - Public Innovation Intermediaries (PIIs)

The protagonists in this thesis, Public Innovation Intermediaries (PIIs), are organizations where majority of its funding originates from the public sources and are entities that support collaboration between two or more parties, play a key role in enabling different actors to work together to generate value in national and regional innovation systems (De Silva, et. al, 2022; Russo et al., 2018; Landoni, 2017; Boon et al., 2011; Howells, 2006). Public intermediaries were originally mandated to bridge gaps between science and the market and often support relatively high-risk collaborative projects that address a government mission and where systemic changes are required (De Silva, et. al, 2022; Rossi et al., 2022; Russo et al., 2018; van Lente et al., 2003).

PIIs are mandated by regulations and policy in the respective operating country or region where they operate. Under the given mandate, PIIs may perform a broad range of functions and activities. Except for the mandated restrictions, the roles played and functions performed by PII's are also similar to what we have already discussed in section 2.3.2.2 (Roles, functions and activities of II) in general (Duan & Jin, 2022). Therefore, without reiterating the general functions (and roles), we will elaborate special functions performed by PIIs in the next section.

2.3.3.1 - Roles and functions performed by Public Innovation Intermediaries

PIIs are involved in research-based functions including the sharing of knowledge and technologies, protection of IPR and commercialisation of research. (Meyer et al., 2019). PIIs further, assist in facilitating the match between research institutes and industry by mapping the skills, knowledge, and objectives of the two sectors. Sometimes PIIs create opportunities to bring the two sides together, for example through publicly funded applied research projects or staff exchanges (Rossi et al., 2022).

Further, PIIs are known for playing systemic functions (a) either by maintaining or taking initiative in the development of a nascent innovation system connecting actors who otherwise work in isolation, (b) where often supply and demand are not clearly articulated, or

(c) they support innovation by weak actors such as startups and SMEs and their involvement with an existing innovation system (Russo et al., 2018). To execute these functions, PIIs undertake various combinations of activities aimed at supporting the formulation of demand, facilitating the alignment of actors and managing pools of different resources (Klerkx and Leeuwis, 2008; Van Lente et al., 2003).

PIIs are often found performing transition function when they support system-wide transformations such as transitions towards sustainability, and also when facilitating transitions towards new innovation systems where the old system is disrupted and foundation is laid for a new way of operation (Kivimaa et al., 2019a; Van Lente et al., 2003). PIIs organize networks of actors promoting change, help to realize collective sense of the new system, (Boon et al., 2008), and support the construction of new technological architectures (Rossi et al., 2022).

Having identified the special functions performed by PIIs, in the next section we discuss the importance of PIIs in innovation systems, over their private counterparts, especially with respect to weak actors such as start-ups.

2.3.3.2 - Importance of Public Innovation Intermediaries in Innovation Systems

PIIs operate as per a mandate and regulations, and are either entirely or partially dependent on the extent of their public funding. Therefore, they are frequently seen operating in non-market contexts, that is, where the market or innovation system is unattractive to private sector or cannot operate effectively by the private sector, or where the market has public interests to pursue (eg. health, elder care) (Rossi et al., 2022; Russo et al., 2018; Kivimaa, 2014; Intarakumnerd and Chaoroenporn, 2013).

Legitimacy is another important aspect related to PIIs. Any organization requires legitimacy to sustain their operations. PIIs enjoy legitimacy because it is formally conferred on them by the public policy, regulations and mandate that created them. Backed by this formal legitimacy, PIIs gain informal legitimacy also over time through the development of their competences, reliability and trustworthiness (Rossi et al., 2022).

The combination of the special functions performed by PIIs with the added legitimacy and non-market (non-profit) oriented nature is vital for weak actors such as startups and SMEs.

For example, a startup endorsed by a PII will have more rapport in negotiations and projecting trustworthiness.

2.3.3.3 Summary of Public Innovation Intermediaries

PIIs not only perform the same functions as their private counterparts, but also perform additional functions which are not-attractive to the private sector (Duan & Jin, 2022). They often operate on a non-commercial basis. However, they collaborate between market actors (industry) and research institutions to commercialize R&D, laying the foundation to grow local and regional economies. They further provide added legitimacy, reputation and trustworthiness to associated actors or entities, especially benefiting the start-ups and SMEs.

PCP, where the scope of our research work lies, involves start-ups and SMEs collaborating with government entities such as the ministry of defense and health department. Due to the involvement of the weak actor (eg. startup) and the non-market actor (eg. health department), PIIs are more suited to intermediate the two parties. In section 2.4 we will review and discuss the literature available on the intersection of PIIs acting in the PCP process.

2.4 - Public Innovation Intermediaries in Pre-Commercial Procurement

The ‘unit-of-analysis’ of our research is the PIIs involved in the PCP process. This intersects two streams of literature, (i). literature on public procurement and (ii). literature on innovation intermediaries. We have so far discussed in sections 2.1 and 2.2 the first stream, where we started with the more conventional public procurement instrument, namely PPI, which has evolved over nearly seven decades, and then moved on to discuss the complementing instrument of PCP. The second stream (IIs) was discussed, in section 2.3 where we initially provided an overview to IIs and then discussed specifically about PIIs. In this section we discuss the intersection of the two streams. First, we look at the challenges to the PCP process.

2.4.1 - Challenges in Pre-Commercial Procurement

In sections 2.1 and 2.2 we have discussed the importance and mechanisms of procurement of innovation by the government sector (PPI and PCP). However, the procurement of innovation

is bundled with several challenges, as opposed to standard procurement (eg. framework agreements, open bidding). We list four such challenges existing in PCP process;

1. Identifying the demand-side requirement for innovation and understanding and assessing the market (both size and requirement) and its opportunities, both in terms of what is already available and in terms of what the market could deliver feasibly (Edler & Yeow, 2016; Uyarra et al., 2014; Edquist & Zabala-Iturriagoitia, 2012);
2. Assessing the requirement and possible technological feasibility via innovation (Edler & Yeow, 2016; Jillian et al., 2015);
3. Establishing incentive structures that reflect the risk–reward distribution, to ensure those actors that bear the risk of innovation also share some of the efficiency or reputational gains associated with innovation. (Edler & Yeow, 2016)
4. Implementing the innovation and changing organizational procedures, routines and capacities needed to do so (Edler & Yeow, 2016; Rolfstam et al., 2011; Rye and Kimberly, 2007).

Note: In the PCP perspective, achievement of the fourth challenge is limited to a prototype or a pilot run of the solution. Large-scale implementation is handled only in the public procurement of innovation processes.

2.4.2 - Public Innovation Intermediaries in Pre-Commercial Procurement

The challenges involved in PCP call for a better specification of the actors and the intermediaries that shape the process. Following are some of the common functions performed by the PIIs facilitating PCP whilst overcoming the challenges mentioned above:

- ***Demand Articulation***: Addresses challenges 1 and 2
- ***Boundary Spanning***: Addresses challenges 2, 3 and 4
- ***Transferring of innovation and appropriation***: Addresses challenges 3 and 4

In the next sections, we discuss these functions in more detail.

2.4.2.1 - Demand Articulation

In innovation procurement often the demand is unclear and misinterpreted. Traditional procurement barriers include limited interaction between demand and supply and the future

innovation requirements are often poorly articulated (Selviaridis & Spring, 2021; Georghiou et al., 2014; Uyarra et al., 2014). The reasons for poor articulation of demand being (a) the limited ability of the buyer (demand-side) to understand and articulate current and future needs, owing to lack of expertise knowledge (eg. medical practitioners on technical equipment), (b) inadequate understanding of supply markets and supplier capabilities, mainly due to the bureaucratic departments with the need not usually employing human resources in sourcing and procurements, (c) limited interactions between buyers and suppliers to co-define problems and solutions, (d) poor coordination between different units within the buying organization, (eg. poor coordination in healthcare between the practitioners and procurers) (Selviaridis & Spring, 2021).

Once the demand is articulated, it has to be properly communicated with the objective of attracting suppliers of innovative solutions. Thereafter, the PCP process needs to be initiated. Throughout the process the PII has to balance several stakeholders who most likely have conflicting interests.

Articulation of expectations and visions

In PCP, actors seek to articulate demand for novel solutions that tackle problems related to the general public or public institutes and improve public services (Uyarra et al., 2020). Demand articulation is an early-stage PCP function concerned with “doing the right thing”. (Selviaridis & Spring, 2021; Boon et al., 2011), and translate them into specific requirements for implementing non-existing market solutions (Boon and Edler, 2018; Selviaridis & Spring, 2021). However, most government institutes have only centralized procurement divisions, and they may not understand the individual department requirements properly. (Selviaridis & Spring, 2021; Edler and Yeow, 2016; van Lente et al., 2003)

Intermediaries act as drafters of the demand translating client’s language into the technical domain. This is crucial for innovation procurement as it provides the direction for the subsequent process (Kivimaa, 2014). Demand articulation involves the identification of the needs and requirements; generation, and dissemination of knowledge between different actors. Sometimes, they have to foresight (vision) the future technology requirements (eg. inclusion of AI in providing information at the public offices). (Backhaus, 2010; Klerkx and Leeuwis, 2009; Stewart and Hyysalo, 2008; Howells, 2006; Bessant & Rush, 1995). This

stage involves interactive learning between producers and potential users of innovations to identify unmet, latent, or fragmented needs. Intermediaries further benefit with the accumulated know-how which acts as tacit-knowledge and help the subsequent demand articulation. (Bessant & Rush, 1995)

Demand articulation further involves learning inside the demand-side actor organization, as well as the technology requirement. This technology assessment acts as a key input in demand articulation processes. (Boon et. al, 2011).

Communication and dissemination of knowledge

Once the demand is clearly drafted, it needs to be communicated with potential suppliers and other key stakeholders involved. However, the dissemination of knowledge usually does not end there for the PII. As opposed to traditional public procurement processes, intermediated PCP processes facilitate “conversations” (Uyarra et al., 2017) between buyers and potential supplier/s, which help to identify the actual problems facing buying organizations, leading to refined definitions of needs (Van Winden and Carvalho, 2019). PIIs, through their own expertise, can also identify and assess supply market options, assist in procurement, and facilitate the adoption of solutions (Edler and Yeow, 2016).

Filtering and matchmaking

It should also be noted that not all public procurement requirements are suitable to go through a PCP process. In such situations, intermediaries also have to assess the actual requirement and do a screening or filtering and scope the demand before initiating the match-making process (Klerkx & Leeuwis, 2009; Howells, 2006). The PCP process requires certain investment to be made by the intermediary. PIIs do not receive any return on their investment. Therefore, resource dependencies in particular, may force intermediaries to exercise a certain amount of screening in demand articulation (Klerkx & Leeuwis, 2009).

Initiating the PCP process

When concerned with intermediaries specific to the PCP process, they also have to initiate the PCP process together with demand articulation (van Welie et al., 2020; Klerkx & Leeuwis, 2009). Procurement tasks in initiation of PCP consists, among others, of identifying potential suppliers, and contracting. Procurement professionals either in-house or hired

(consultants) can also support demand articulation and influence the shape of PCP process, for example by refining specifications to engage a wider pool of suppliers and defining alternative measures of evaluation (Miller and Lehoux, 2020).

Negotiation with all stakeholders

Often the procurement of innovation involves collaboration with different actors related to technical, administrative, legal and financing backgrounds, in addition to the actual users of the innovation. These different parties have different perspectives of innovation and may have conflict of interests. Therefore, one of the roles of IIs is to manage these different perspectives. In order to do so they need to understand the different perspectives of the actors involved. Continuous learning is therefore important to institutes who are involved in PCP as intermediaries (van Weele et. Al, 2020; Kivimaa, 2014; Boon et al., 2011).

2.4.2.2 - Boundary Spanning

The term boundary spanning can be interpreted in different ways such as facilitation of collaboration between parties, geographical regional collaboration or inter-industry collaboration. For our purpose we focus on facilitating procurement of novel solutions that would have been difficult under the traditional procurement process and introduction of startups and SMEs to public procurement, which was usually a playing-field for large corporations. Intermediaries have the capability to attract more suppliers (and other related parties) than would have happened under normal procurement such as framework agreements, or open bidding.

Strategy Formation

Disrupting the established processes such as traditional public procurement, familiarized and rooted to government institutes is difficult. Therefore, PIIs in PCP facilitation need to formulate a proper strategy. They have to still preserve impartiality and equal right of participation to every party interested in the deal, where no participating party after the PCP process, are at a disadvantage. The strategy should back the existing policies and other regulations. (Selviaridis & Spring, 2023; Boon et. al., 2011). The strategy acts as the instrument in facilitating assistance to start-ups and SMEs in the PCP process (van Lente et al., 2003).

Impartiality and deep engagement

In any public procurement process suppliers' perceived risks of sharing knowledge and ideas with competitors. This is more prominent among start-ups and SMEs as the knowledge is one of their VRIN resources. Therefore, in a PCP process involving SMEs and start-ups the PII has to manage the “impartiality” and “deep engagement” in projects where all participants are obliged to endorse. In line with impartiality, the PII also needs to provide informed (impartial) advice to all potential suppliers (Selviaridis & Spring, 2023; Boon et. al, 2011).

The “deep engagement” principle, on the other hand, assures suppliers that sponsoring units were taking their involvement in projects seriously. Often start-ups and SMEs do not participate in public procurement, due to the poor impression of the departments. However, involvement of a PII provides the feeling of seriousness in the project and it encourages SMEs to take part in the procurement process (Selviaridis & Spring, 2023).

The trust created through impartiality and deep engagement expands the boundaries in terms of participation of start-ups and SMEs.

Managing financial resources

A public procurement process (tendering) involves certain preparation and in case of innovation, it involves a certain degree of proof of concept (eg. prototype, minimum viable product), which is costly in development. All the non-awardees lose this investment at the end of the tender process. Our background search revealed to us that another reason why start-ups and SMEs are hesitant in bidding is due to the potential loss of investment (both financial and non-financial investments). Therefore, provision of financial assistance is important in the PCP process. (Klerkx & Leeuwis, 2009; Stewart and Hyysalo, 2008; Howells, 2006; Bessant and Rush, 1995).

Creation and facilitation of networking

When it comes to successful procurement, it is important to establish and maintain a solid social and professional network, involving different actors. (Kivimaa, 2014; Bessant & Rush, 1995). Start-ups and SMEs can easily access required resources such as domain experts, technology consultants, academics, legislators via these social and professional networks. Networking is found to aid exploitative innovation (De Silva, et. al, 2022). Under this

sub-function, identifying sources of strategic intelligence (eg. trade organizations, associations, expert service providers, academics, legislators), building links between these sources aiming at stimulating synergy and enhanced knowledge sharing, improving accessibility for all relevant actors and stimulating the development of the potential to improve the outcome of innovation tailored to the requirement (Klerkx & Leeuwis, 2009; van Lente et. al., 2003).

2.4.2.3 - Transferring of Innovation and Appropriation (IPR)

PIIs usually facilitate PCP by means of a competition or an open challenge (Selviaridis & Spring, 2021). At the end of the challenge phase a prototype or a minimum viable product is developed by the selected supplier and this innovation now needs to be procured through usual public procurement instruments (Bessant & Rush, 1995). For this several other suppliers can also bid (refer diagram 01 in section 2.2.2). Since selection at the PCP process does not guarantee a contract, the PIIs must facilitate means of transfer of this innovation. Most often, the developer has the patent (and other IPR) right, but the solution is transferred in terms of licensing mediated by the PII. Since the PCP usually leads to protectable intellectual products, the intermediary in PCP must at all times maintain information gatekeeping.

Technology assessment and evaluation

Once a project is selected, the requirement needs to be assessed against the existing technologies. The availability could be within the public sector in a different institution, within the country owned by the private sector, or available outside the country. If the technology is available, the PII has to facilitate in adapting this technology with specific tailoring to suit the requirement. If not the technology needs to be developed from scratch (Howells, 2006). The technology assessment and evaluation function is not linear and not a single-time one. It takes a few iterations along with demand articulation, and may also be included as a part of the latter.

Prototyping and piloting

The final outcome of the PCP process is usually a prototype or a minimum viable product. The PII together with the buyer (demand-side), carry out inspection, tests, diagnostics and

analysis at several stages of the prototype development. The objective is to ensure the 'fit-for-use' of the final solution. Sometimes, a pilot project may be required to be carried out. This process will assess the technical feasibility of the solution. Once agreed upon a solution (prototype or MVP), the financial feasibility and sustainability also needs to be assessed (Howells, 2006).

The responsibility of the PII does not stop at feasibility assessment. Further they have to validate the solution to assess the fit within existing policies and regulations (eg. data protection policy, sourcing policies). The PII step-in to regulate the solution where necessary. This function is assisted by the assessment carried out at various stages of the PCP process.

Gatekeeping

Gatekeeping and aligning function is aimed at matchmaking and brokering of the innovation in a confidential manner ensuring the start-up maintains its IPR. The intermediary has to protect the confidential information specific to the solution during all stages of the PCP process including negotiation and deal making, facilitating contract negotiation once partner(s) selected. The intermediary also provides contractual advice to the selected supplier in finalizing the contract and transferring the solution (Howells, 2006).

2.4.3 - Summary

In this chapter we have discussed about the PIIs in the PCP process, which is the 'unit-of-analysis' of our research. We provided an overview to the PIIs and then discussed about special functions they perform as opposed to their private counterparts. We further highlighted the challenges inherent to the PCP process and then devised three instruments (functions) that a PII needs to carry to overcome these challenges. These instruments, namely (a). Demand articulation, (b). Boundary spanning, and (c). Transferring of innovation and appropriation acts as the pillars of the theoretical framework we formulated to further carry out the research work. The theoretical framework and the respective definitions are discussed in section 2.5.

2.5 - Theoretical Framework

After looking at literature in PCP, PPI, and PII, and looking at definitions for roles and functions performed by PII's we present our theoretical framework with the following definitions. To define

Public Innovation Intermediaries- Definition:

We are expanding Howell's (2006) definition on IIs to define PIIs as "An organization or body that acts an agent or broker in any aspect of the innovation process between two or more parties, where whose primary funding is received from a public institution" broad functions of such intermediary activities include:

- Providing information about potential collaborators
- Assimilating and disseminating knowledge
- Brokering transactions between parties
- Mediating between collaborating organizations
- Assisting in finding advice, funding, and support for collaboration outcomes

Pre-Commercial Procurement definition:

For PCP, we could not locate a sound definition, in the very depleted and fragmented literature base. Therefore, we synthesized the following working definition to define the PCP process.

Pre-commercial Procurement (PCP) can be defined as an innovative public procurement approach where public sector entities stimulate innovation by procuring research and development (R&D) services to address specific public sector challenges. This process involves a competitive phase-based approach, enabling the shared risk-benefit of developing innovative products and solutions, from initial concept to limited volume production. PCP primarily focuses on the phase before commercialization, thus not constituting State aid.

Role definition:

After analyzing the limited available literature on PIIs in PCP, we found that the specific functions (or roles) expected from a PII are not clearly defined, investigated or researched. Therefore for the ‘Roles’ and ‘Functions’ of a PII, we formulate our own working definition.

The roles of PIIs (PII) in Pre-commercial Procurement (PCP) can be defined as the various positions and responsibilities they undertake to bridge the gap between public sector needs and innovative solutions. This includes facilitating the dialogue between different stakeholders (public entities, private companies, research institutions), identifying and articulating public sector challenges that can be addressed through innovation, aiding in the drafting and management of PCP calls, and supporting the evaluation of proposed solutions. PIIs play an instrumental role in managing the risks, uncertainties, and complexities involved in the PCP process, and work as a *matchmaker* between supply and demand side perspectives.

Functions definition:

The functions of PIIs (PII) in Pre-commercial Procurement (PCP) can be defined as the specific tasks and activities they perform to fulfill their roles. Key functions may include:

- Demand articulation: identification of the needs and requirements; generation, and dissemination of knowledge between different actors.
- Boundary spanning: Facilitating innovation than would have been possible with normal procurement processes, such as involvement of R&D, involvement of novel technologies.
- Transferring of innovation and innovation appropriation: This includes successful role-out of innovation to the demand-side and activities such as patenting, licensing and other related IPR.

Aligning with the above definitions we use the following theoretical framework as the lens for formulating interview guides, and analyzing the empirical evidence in our research work:

Table 02: Theoretical framework

Demand Articulation	Boundary Spanning	Innovation Transfer and Appropriation
<ul style="list-style-type: none"> ● <i>Articulation of expectations and visions</i> (Boon et. al., 2011; Backhaus, 2010; Klerkx & Leeuwis, 2009; Howells, 2006; van Lente et al., 2003) ● <i>Communication and dissemination of knowledge</i> (Backhaus, 2010; Howells, 2006; Bessant & Rush, 1995) ● <i>Filtering and matchmaking</i> (klerkx & Leeuwis, 2009) ● <i>Initiating the PCP process</i> (van Weele et. Al) ● <i>Negotiation with all stakeholders</i> (van Weele et. Al) 	<ul style="list-style-type: none"> ● <i>Strategy formation</i> (Boon et. al., 2011; van Lente et al., 2003) ● <i>Deep engagement</i> (selveradis et. al, 2023) ● <i>Managing financial resources – finding potential funding and funding activities</i> (Klerkx & Leeuwis, 2009; Stewart and Hyysalo, 2008; Howells, 2006; Bessant and Rush, 1995) ● <i>Provision of advice and support</i> (selveradis et. al, 2023; Boon et. al., 2011; Klerkx & Leeuwis, 2009) ● <i>Creation and facilitation of networking</i> (Klerkx & Leeuwis, 2009; van Lente et. al., 2003; Boon et. al., 2011) 	<ul style="list-style-type: none"> ● <i>Gatekeeping</i> (Howells, 2006) ● <i>Technology assessment and evaluation</i> (Howells, 2006) ● <i>Prototyping and piloting</i> (Howells, 2006; Bessant & Rush, 1995)

2.6 - Conclusion to Theory Chapter

This chapter has provided a detailed and informative overview of the theoretical foundation for our research on Public Innovation Intermediaries (PII) in the context of Pre-Commercial Procurement (PCP). We began by summarizing the PPI process, which serves as a precursor to PCP, highlighting its significance in promoting innovation within the public sector. Building upon this, we then delved into the PCP process itself, emphasizing its unique characteristics and potential for fostering collaboration between the public and private sectors.

Recognizing the pivotal role of intermediaries in facilitating innovation ecosystems, we proceeded to examine innovation intermediaries in general. This examination shed light on the diverse functions and activities these intermediaries undertake to bridge the gap between various stakeholders and facilitate innovation processes. Specifically, our focus then shifted towards Public Innovation Intermediaries (PII), where we provided a comprehensive discussion on their roles, functions, and significance within the innovation landscape.

The subsequent section explored the specific context of PIIs in PCP. By examining the intersection of these two concepts, we were able to uncover the distinctive characteristics and challenges that arise when PIIs engage in PCP processes. This analysis contributed to a deeper understanding of the complexities and dynamics involved in PII-PCP intersection.

Building upon the insights gained from our literature review, we developed a theoretical framework that will guide our further research. This framework served as the foundation for developing our interview guide that was used to gather empirical data from relevant stakeholders involved in PII-PCP collaborations. Additionally, it will inform the analysis and interpretation of the collected data, allowing us to discern our main research question; “*key characteristics that characterize successful PIIs in the context of PCP*”.

Overall, this chapter has laid the groundwork for our research by providing a comprehensive review of the theoretical underpinnings of PIIs in PCP. It has highlighted the significance of the theoretical framework in guiding the development of the interview guide and the subsequent analysis of the empirical data.

Note: The theoretical framework presented in this chapter is only to analyze the 1st research question “*What characterizes public innovation intermediaries that work with pre-commercial procurement processes?*”.

To the best of our knowledge there is no literature investigating and comparing operational challenges faced by PIIs in PCP context. Therefore, the second research question, “*What are the challenges public innovation intermediaries that work with pre-commercial processes are facing?*” is purely investigative.

3.0 - Methodology

The preceding chapter detailed the theoretical framework of our investigation, highlighting the roles and functions of public innovation intermediaries (PIIs). This chapter aims to outline the methodological approaches utilized to delve deeper into this subject matter. Our research focuses on four specific PIIs operating within Europe, StartOff, CivTech, Startup in Residence (SiR) Amsterdam and Startup in Residence (SiR) Intergov. This selection criterion stems from our desire to study PIIs functioning under a similar legislative framework, specifically European procurement legislation. A shared legislative context enhances the reliability of cross-case comparisons, as the operational boundaries are comparably set for all entities.

The PIIs were chosen based on their public prominence and their potential to offer rich, varied insights into the research questions. While operating under the same broad legislative framework, these PIIs differ in terms of their size, strategy, and innovation focus, providing a broad yet cohesive field for comparative analysis. These cases were analyzed within a multiple case study design, enabling a comparison and contrast of the identified PIIs.

Our approach employs a mixed-methods strategy that combines content analysis of publicly available data with recurring qualitative video interviews. Notably, our research methodology is shaped by the principles of systematic combining - an abductive approach that stresses the continuous interplay between the empirical world and the theoretical model world.

Introduced by Dubois and Gadde (2002), systematic combining allows for a dynamic and iterative process, guiding our understanding of both empirical and theoretical phenomena. The benefit of this combined approach is the generation of a more comprehensive picture, taking into account the different aspects of PIIs' functions and roles, and offering insights into the practical operation and development over time.

To begin, an extensive review of the PIIs' websites and news articles concerning these entities was conducted. The primary objective of this review was to identify and collate all relevant information about the PIIs' activities, functions, and roles prior to the interviews. This allowed us to establish an overview of each case, mapping out their individual characteristics, goals, and undertakings. Such an exercise provides not only a solid understanding of the cases, but also a means to compare and contrast the identified PIIs. It also serves as a

contextual basis that guides the subsequent interview process. We also made some preliminary phone calls to PIIs to get some basic information.

For a deeper understanding, we also conducted qualitative video interviews with the employees of these PIIs. These interviews were scheduled at regular intervals to provide longitudinal insights into their practices and development. This approach offered us an insider's perspective into the PIIs' key operations and enabled us to gather firsthand insights on their evolving roles, responsibilities, and strategies in innovation. The recurring nature of these interviews ensured that the changes and developments within the PIIs could be traced and documented over time.

In this chapter, we will provide a more detailed account of our research design, the data collection process, and the strategies employed for data analysis. Furthermore, we will discuss the chosen methods' strengths and limitations, providing a transparent and reflexive account of our research journey. By implementing a comprehensive mixed-methods approach, we aim to contribute a nuanced understanding of PIIs and their role within the landscape of innovation.

3.1 - Systematic Combining: An Abductive Approach to Explore Public Innovation Intermediaries in PCP Context

Developing a method to explore PIIs presented a unique challenge. While abundant literature delves into the role of PIIs in specific markets or sectors, addressing particular legislative and start-up/SME-specific challenges, comprehensive literature on PIIs themselves and the strategic characteristics leading them is scant.

Thus, our structured literature review, alongside existing theoretical frameworks, had to be complemented with empirical data to steer our research effectively. Echoing the sentiments of Dubois and Gadde (2002), our research approach was characterized by a continuous oscillation between the empirical world of practice and the theoretical world of models.

Though case studies have occasionally been critiqued for their lack of scientific generalization, we contend, along with Dubois and Gadde, and in alignment with Weick (1979), that they offer invaluable contextual insight susceptible to change over time. This temporal dynamism necessitates situational interpretations, transforming empirical case study

learning into a strength rather than a weakness. Hence, we adopted Dubois and Gadde's (2002) systematic combining method, a back-and-forth movement between different research activities and between empirical observations and theory, which serves to enhance understanding of both empirical and theoretical phenomena.

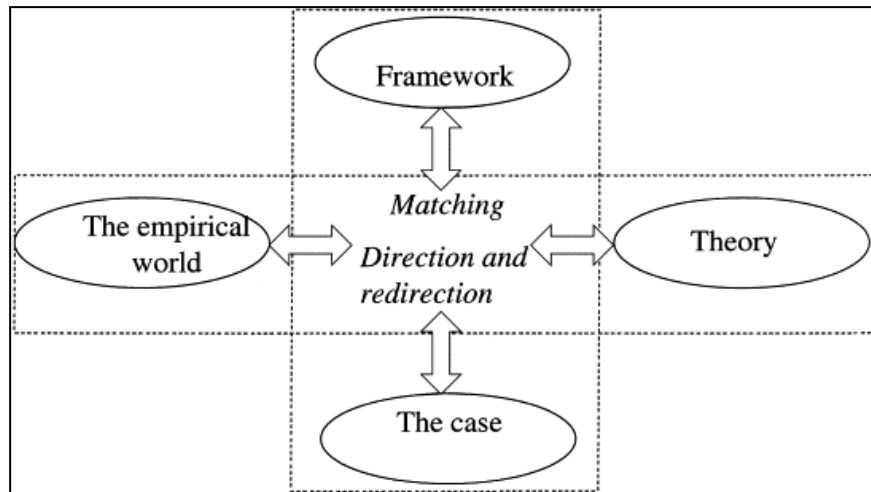


Figure 02: The systematic combining approach (Dubois & Gadde, 2002)

We initiated our exploration into PIIs by informally engaging with StartOff and EAFIP (European Assistance for Innovation Procurement), rather than conducting structured interviews. These early dialogues helped unpack the complexities of pre-commercial procurement (PCP), public procurement of innovation (PPI) and the landscape they operate in. Insights garnered here deepened our understanding of Europe's smart procurement processes and corresponding toolkits, laying a preliminary foundation for our research.

Next, we delved into literature on PPI, PCP, and PII, aiming to construct an initial theoretical framework. This framework shaped our early interpretations and the research structure. With this preliminary theoretical backdrop, we designed an interview guide for conducting structured interviews with StartOff, CivTech Scotland, SiR Amsterdam, and SiR Intergov, leading to a wealth of diverse perspectives on the roles, functions, and activities of these PIIs.

The insights from these interviews provoked a return to the literature, in an iterative process that refined our theoretical framework. This evolution led us to develop our definitions for PCP and 'Role', 'Function' for PII. An examination of 'functions' helped identify characteristics of PIIs, shaping our primary research question.

In the next research phase, we applied our analytical framework to our case studies, always maintaining a commitment to validate our interpretations. We cross-verified our information and analysis with our case organizations and revisited StartOff and CivTech Scotland for additional interviews to ensure thorough coverage.

To summarize, our research method followed a cyclical process of systematic combining, swinging between theory and empirical data. This iterative methodology facilitated a more nuanced understanding of the roles and functions of PIIs, substantially enriching our research.

3.1.1 - Strengths of Systematic Combining:

In conducting our research, we valued the versatile nature of the systematic combining approach. Its capacity to integrate varied types of evidence, from qualitative insights from interviews to quantitative data, provided us with a broad perspective on the roles and functions of PIIs.

Systematic combining effectively joined different strands of knowledge, which was crucial in building a coherent understanding of our research problem. It helped us identify patterns, inconsistencies, or gaps across different studies, which further shaped our conceptual frameworks and models.

The methodological transparency and possibility for replicability in systematic combining fortified the reliability of our findings. This approach offered us a level of confidence in the solidity of our research, which was important in our quest for thorough insights.

Lastly, we found systematic combining useful when dealing with multifaceted research questions. As our research required exploring various dimensions and different research streams, this approach facilitated an in-depth analysis and interpretation of our data, contributing to the overall depth of our research.

3.1.2 - Weaknesses of Systematic Combining:

While the systematic combining approach brought significant value to our research, it also presented certain challenges that we had to navigate.

Firstly, the systematic combining approach can be resource and time-intensive. The process involves a broad search, meticulous data extraction, and thorough synthesis processes, all of which require significant investment in terms of both time and resources. As researchers, we had to strategically plan and allocate our resources to maintain the quality and rigor of our synthesis.

Secondly, we realized that systematic combining may not be universally applicable to all research questions or contexts. The suitability of this approach largely depends on the nature of the research problem and the availability of relevant studies. Consequently, we had to carefully evaluate the requirements and constraints of our research before deciding to employ systematic combining.

We also faced challenges due to the heterogeneity and potential incompatibility across data sources, study designs, and theoretical frameworks. The act of merging diverse sources of evidence invariably introduces variations in data quality, methods, or findings, which can complicate the integration process. As a result, we had to address these heterogeneities conscientiously and assess the compatibility of the included studies.

Finally, despite the systematic nature of this approach, the risk of potential bias and subjectivity persists. Choices made during study selection, data extraction, and data interpretation can inadvertently influence the outcomes. Thus, we had to be vigilant, documenting our decisions transparently and continuously considering potential sources of bias.

In summary, the systematic combining approach, while offering significant advantages such as comprehensive insights and robust analysis, also presents some challenges including resource-intensity, limited applicability, heterogeneity issues, and the potential for bias. As researchers, recognizing these potential limitations was a crucial aspect of applying this methodology in our studies.

3.2 - Research Approach

3.2.1 - Qualitative method - Video Interviews with Public Innovation Intermediaries

In order to address our research questions, we have primarily decided to conduct qualitative interviews. When studying organizations such as PIIs, qualitative interviews are an incredibly useful research method. They allow for the gathering of in-depth and detailed information about the internal workings and culture of the organization, as well as the perspectives and experiences of employees and other stakeholders (Creswell, 2014; Denzin & Lincoln, 2011). This type of data can provide insight into organizational structure, communication patterns, decision-making processes, and overall strategy and goals (Hatch, 1997; Miles & Huberman, 1994). By researching publicly available information on our cases websites in advance, we showed preparedness and didn't waste the time of our informants and ourselves with obvious questions during the interview, and instead had the opportunity to dig deep into their organizational structures and innovative procurement processes.

Qualitative interviews can also be used to gain insights into the organizational processes and practices (Creswell, 2014; Hatch, 1997), which can help us identify areas of strength and weakness and inform recommendations for improvement or change (Miles & Huberman, 1994). This becomes especially apparent when we compare and contrast our different cases. As a general rule, we interviewed the person originally in charge of starting the Innovative Intermediaries - the "founders" of these new ventures. By talking to the people who were present from the beginning, we could get them to reflect retrospectively over the different stages of the organization, in order to provide us with additional insight.

Additionally, qualitative interviews can be used to gather data on how the organization is perceived by external stakeholders (Creswell, 2014; Hatch, 1997). This information can be valuable for understanding the organization's reputation and brand, as well as any challenges it may be facing in its field (Denzin & Lincoln, 2011). For that reason, we have conducted additional interviews with the contestants that have been matched through PCP-competitions by PIIs and asked them about the process. We were lucky to have close access to a Norwegian startup named Leasi that's currently involved in a PCP-competition through StartOff, due to the fact that we're sharing office spaces with them at the NTNU School of

Entrepreneurship. Since we already have established a high level of trust between us and StartOff, we got rare insight into an ongoing PCP-competition that would have been hard to access otherwise. We deliberately chose not to interview the public procurers in order to narrow the scope of this thesis. Instead, we chose to interview other external stakeholders such as EAFIP about their perspectives on PIIs.

Furthermore, these interviews can also be used to gather data on the organization's industry trends and competitors strategies (Creswell, 2014), which can help researchers identify potential opportunities and threats for the organization, and inform recommendations for future growth or strategic changes. At the initial stages of our research, we thought this aspect would be more relevant if we were analyzing businesses competing for market shares instead of government-backed organizations promoting innovative procurement. However, during one of our interviews with the founder of an PII, we were surprised when the respondent shared an internal document with us that could be compared to a competitor analysis in the business world. In this document, the PII in question had mapped similar actors across the world, together with detailed descriptions of their activities. This openness made more sense after we realized that our research cases are not businesses in competition to one another, but government-backed organizations looking to learn from each other's experiences. Throughout the course of this study, we have also discovered that they share a large degree of open cooperation and discuss their activities freely at conferences, such as the Digital Tech Summit in Copenhagen and Startup Extreme in Norway.

Overall, qualitative interviews can provide a rich and detailed understanding of an organization and its context, which can be useful for a wide range of research purposes, including organizational behavior, management, and strategy studies (Creswell, 2014; Denzin & Lincoln, 2011; Hatch, 1997; Miles & Huberman, 1994).

The following informants have been interviewed:

Table 03: Interviewed cases

Type of informant	Name of institution	Representative	Number of interviews
PII	StartOff	Sissel	2*
PII	CivTech Scotland	Alexander Holt	1
PII	CivTech Alliance	Alexander Holt	1
PII	Startup in Residence Amsterdam	Mark Stoevelaar	1
PII	Startup in Residence InterGov	Maarten van Koolwijk	1
External stakeholder	European Assistance For Innovation Procurement initiative (EAFIP)	Ana Lucia Jaramillo	1
External stakeholder	Leasi AS	Marcus Balcon & Daniel Hansen	1

3.2.2 - Case selection - Public Innovation Intermediaries (StartOff, CivTech, Startups in Residence)

Case selection is an important consideration when performing qualitative analysis, because it determines the scope and focus of the study, and ultimately the generalizability of the findings. Case selection refers to the process of choosing the specific cases or subjects that will be studied as part of the research. The choice of cases can have a significant impact on the results and conclusions of the study. For example, as Creswell (2014) suggests, if a study is focused on a specific type of organization or industry, the choice of cases within that industry will influence the findings. By selecting a diverse range of cases, the researcher can increase the generalizability of the findings, meaning that the results can be more easily applied to other organizations or industries.

There are three different actors within our field of interest, namely the public procurers, the private suppliers and the PIIs. In order to narrow our scope and to proceed towards a sharply defined research question, we will not conduct interviews with the public procurers. Public

organizations can differ greatly in regards to size and nature - and it would require quite a lot of empirical research to gain data that can be generalized to all public procurers. Therefore, we will focus on PIIs in the European Union / EEA-countries, since they are operating under the same broader legal framework making it easier to draw meaningful comparisons.

Additionally, if the study is focused on a specific phenomenon, such as leadership or decision-making, the choice of cases will also influence the findings. According to Miles and Huberman (1994), by choosing cases that are representative with different approaches of innovative public procurement processes, we intend to gain a more comprehensive understanding of the phenomenon being studied - ie. PIIs and their role within PPI.

Furthermore, case selection also influences the researcher's ability to understand the complexity of the phenomenon under investigation and can help to control for potential sources of bias. As Denzin and Lincoln (2011) suggest, in qualitative research the researcher's ability to understand the complexity of the phenomenon under investigation and the researcher's ability to control for potential sources of bias depend on the choice of cases. During the preliminary part of this study, we became conscious of the fact that examples of successful procurement processes/contests are being showcased by PIIs for marketing purposes. Because of that, we have to be careful not to get an overly positive impression of their work - but also keep in mind the unsuccessful processes and learn what went wrong in those cases. Looking for and understanding the failures are necessary in order to see the full picture and learn from past mistakes - in that way our research will provide useful lessons for PIIs looking to improve their success rate.

In conclusion, careful case selection is crucial in qualitative analysis as it has a direct impact on the scope, focus, and generalizability of the study. According to Hatch (1997), by choosing a diverse range of cases and considering the phenomenon under investigation, the researcher can increase the reliability and validity of the study.

3.2.3 - Documents from study participants

Document analysis is a form of qualitative research in which documents are interpreted by the researcher to give voice and meaning around an assessment topic. Through our interviews we have received access to strategic documents related to the public innovation intermediaries operations. These documents revealed the underlying structures, strategies,

and operational processes within the PIIs, giving a practical perspective that complements the more subjective data gathered through the interviews.

3.2.4 - Criticism of our method

The choice to use an abductive approach as opposed to purely inductive or deductive methods revolved around the nature of our research questions and the type of insights we are attempting to generate from them. Given the complex and emergent nature of public innovation intermediaries, systematic combining allowed for a more flexible and adaptive research process that accommodated unexpected findings and continually refined the understanding of the research problems. It was particularly suitable for exploratory research and in situations that allowed for the possibility of surprise and evolving understanding.

However, validating and expanding upon results obtained through an abductive approach requires careful methodologies and future explorations. The validation involves comparing results with other data sources or methodologies, discussing findings with other researchers, checking with participants or field experts, and maintaining transparency throughout the research process. We have strived towards transparency throughout the research process, and checked the results with the study participants before submitting our thesis. We now eagerly await the peer discussions, and hope that more studies will be made on this rather new topic.

For future research, scholars could replicate the study in different settings or with different participants to verify the generalizability of the findings. They could also conduct longitudinal or comparative studies to understand the evolution of the findings over time or in different contexts. Finally, the results from an abductive study can serve as a base for more structured, hypothesis-driven research, thereby extending the study's impact.

4.0 - Empirical findings

In this section of our thesis, we'll be presenting and delving into the findings and insights from our key cases: StartOff, CivTech Scotland, Startup in Residence Amsterdam, and Startup in Residence Intergov. Each of these entities represents unique instances of PIIs, offering valuable internal perspectives on the workings and dynamics within this specialized field. Empirical data gathering is done based on a structured interview guided by the theoretical framework (section 2.5), methodology (chapter 03).

4.1 - Results Section

In the forthcoming section, we present a systematic exploration of our findings regarding PIIs. This comprehensive overview offers a snapshot of their general information, characterizing their critical roles, functions, and activities. Here's a brief layout of the structure we will follow:

1. **Overview:** We start by painting a broad picture of the PIIs, providing a contextual understanding of their general nature and outlining their core aspects.
2. **Role:** Following the general overview, we delve into the specific roles these intermediaries play within the public sector innovation landscape. This discussion sheds light on their essential contributions and the impact they make on the innovation process.
3. **Functions:** Next, we probe into the functional dimensions of the PIIs. This entails investigating their operational mechanisms, their methods of work, and the key responsibilities they undertake in their day-to-day operations.
4. **Activities:** Here, we discuss the array of activities the PIIs engage in to fulfill their roles and functions, highlighting their practical efforts towards stimulating and managing innovation.
5. **Challenges:** Lastly, we turn our attention towards the obstacles that these intermediaries encounter. We identify and discuss the major challenges that PIIs face in their operational context, underlining the areas of concern that require attention and improvement.

4.1.1 - StartOff - Norway

4.1.1.1 - Overview

StartOff is a framework for carrying out start-up-friendly acquisitions, where StartOff offers guidance and project support to the public client and supplier in an organized process. Compared to other arrangements for the procurement of innovation, StartOff is designed for more limited issues with shorter project length and smaller contract amounts. A StartOff project can result in a further acquisition, but the StartOff project itself is limited to 18 weeks of development of an MVP. In other words, their projects fall under the definition of Pre-commercial procurement.

StartOff is administered by The Norwegian Agency for Public and Financial Management (DFØ) and carried out in collaboration with the Directorate of Digitalisation and the National Programme for Supplier Development (LUP). It was initiated in 2021 by Nikolai Astrup, the Minister of Digitalisation under the Solberg government. Since then, StartOff has facilitated 17 PCP-competitions as of 21.01.2023. In December 2022, StartOff was awarded the best innovation leadership award by the European Innovation Council (EIC).

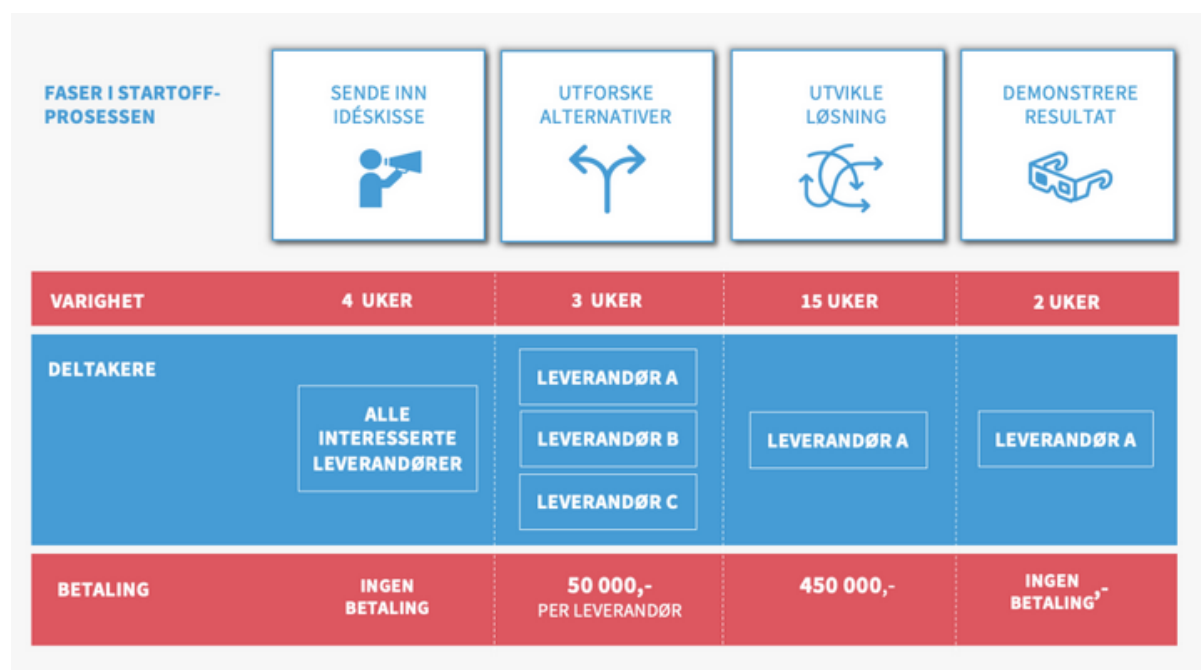


Figure 03: StartOffs Pre-commercial procurement competition.¹

¹ <https://anskaffelser.no/innovasjon/startoff>

The figure shows the four phases of the PCP-process, after the challenge is published. The first stage is an open competition where contestants have four weeks to submit their proposed ideas. The second stage begins when StartOff and the challenge sponsor has picked three potential suppliers to explore different alternatives. This stage lasts for three weeks, and each contestant is awarded 50 000 NOK for elaborating on their submissions. The third stage begins when one of the three contestants has been chosen to develop an MVP, in which they are awarded 450 000 NOK to develop in close collaboration with the challenge sponsor. The last phase of the competition is when the supplier gets to demonstrate their final results to the challenge sponsor and other potential customers. This is where the PCP-competitions officially ends, and the parties go on to discuss an eventual procurement.

4.1.1.2 - Role

The overall role of StartOff is to work as a mediator between the public procurers and innovative suppliers. Their goal is to combine or to match public sector needs and public sector buyers, with startups (and SMEs) to solve challenges in the public sector. The way public procurement regulation works today in Norway - long tender processes with suppliers competing on price, product and project timelines - is not tuned to the rapid growth of digital innovation. New technologies emerge and are developed every day by young startups and entrepreneurs, but they do not have the knowledge or resources to participate in long tender processes they are not guaranteed to win. So, StartOff has developed a PCP-competition, in accordance with a loophole in the European procurement regulation,² that allows for the procurement of innovation in the time before a public tender is announced. In the PCP phase they can host competitions tailored to future tenders on behalf of public procurers, creating an environment where they can judge suppliers on idea, team, technological, and other entrepreneurial factors. In other words, StartOff also has a role of understanding, interpreting and identifying loopholes in regulation in order to reach their goals of matching public procurers with the right startup.

² Article 14 EU Directive 2014/24.

4.1.1.3 - Function

Articulation of demand

One of the perhaps most important functions of StartOff is articulating public sector demand in a way that suppliers such as startups understand. Startups have difficulties with reaching the public sector procurement system due to its complexity and regulatory nature. Facilitating the whole process up to the pre commercial stage, as well as handling project management, competence needs, and transparency reduces risk for public procurers. StartOff works in parallel with suppliers and procurers to build competence and knowhow, bridging the gap between public sector and startups.

In StartOff's competitions, procurers will initially work with StartOff to formulate a clear problem description for a specific problem, that will later be posted as a public tender open for all. However, by first participating in the competition, the procurer will be able to work with a single supplier with the best idea in a classic lean methodology approach. In that way, when the time comes for listing the public tender, the procurer will have a tailored solution that has been facilitated by StartOff. The process reduces risk, and increases the quality of the product the procurer eventually purchases.

Another important function of StartOff is to source, match and combine the correct public actor with the right startup. StartOff works to identify public sector needs across the public sector sphere, and source the startups they believe can be a good match. StartOff, as a PII actor, has to make sure the startups, or supplier side, provide enough innovative height for the public entities they work with.

Working with the public procurers StartOff makes sure that the description for a specific problem is made clear and narrow enough. In StartOff's experience, the clearer and specific the problem description from the public actor, the more startups understand how they can contribute. StartOff has experienced that in order to increase the value of their competitions, and the success of their projects, the public actor should ideally have a project manager with some authority with the time to work with the startup in the competition period. Good solution has to be worked on from both sides, with the public actor constantly working with the supplier on the idea, problem and solution.

Working with multiple actors

An important function of StartOff as an PII is to build strategy across actors, sectors and markets. Their current PCP framework is based on templates from Scotland and the Baltic countries, but they are tailored to the Norwegian market and the Norwegian public procurement regulatory system. They work with many different actors, agents, procurers and levels to build trust and interest for suppliers of innovation such as startups and SMEs. They take into account political and societal trends such as sustainability, green transition, digitalization, and build their process around this. StartOff is constantly challenging themselves to improve and how they can improve their process and be more effective.

Network formation.

Creating good networks is important for StartOff. StartOff works to build professional networks across sectors and domains in order to foster change and market their competitions. They are actively out in incubators, innovation ecosystems and accelerators in order to showcase StartOff as a link to public sector demand. They participate in events hosted by regional municipalities, and also invite public actors to StartOff events such as demo days.

When promoting their competitions they have to balance the public sector regulatory framework, with reaching suppliers. Their dual system involves reaching the suppliers through social media or through direct channels such as mail, and they post important documents for the competition at Doffin, as well as their own web site to remain transparent for public entities.

4.1.1.4 - Activities

Attending innovation events

StartOff attended Startup Extreme, an event for investors and startups held every year in Hemsedal. The first time they attended they had a great experience. However, Startup Extreme did not invite the public sector actors - the demand side. This makes startup extreme a bit redundant for StartOff, as startups are not their main target audience at this time. The conference itself probably has to be scaled up, potentially incorporating a greater number of public entities. Currently, there seems to be a lack of arenas conducive to fostering discussions between the public sector and startups. The networking activities are not

particularly tailored towards innovation through public security and demand, leaning more towards investors instead.

Sprints - Working like a startup

In order to increase the number of potential challenge sponsors, StartOff initiated a week-long sprint. They dedicated this sprint to contacting public organizations, in order to inform them about StartOffs PCP-challenges and inviting them to submit a challenge. This undertaking was noted as being both exciting and demanding, requiring concentrated effort over a single week. The stated objective was to engage with fifty potential participants, establish meetings, and execute this operation in a manner resembling a sales sprint. This approach was deemed successful, and current efforts are focused on following up on these leads.

However, a concern emerged from this method; the risk of all projects launching simultaneously. Such a situation could create a surge in demand, likened to the sudden release of ketchup from a bottle. To avoid a possible deluge of projects in the autumn, it was suggested that the project launches should be spread out over time.

While a considerable amount of resources was channeled into marketing, an intriguing observation was made: the overwhelming number of potential leads. This intense yet innovative working method introduced a dynamic element into the process.

4.1.1.5 - Challenges

Attracting the demand side

StartOff faces several challenges that are not immediately apparent when looking at them from an outside perspective. The clearest challenge they face is getting enough challenges (procurement projects) from the procurers into their competitions. The risk aversion and culture in the public sector is hard to change. Public procurers look for solutions to problems. However, innovative solutions are not always clear, and often they don't even exist yet. Public procurers are not used to working with problems in such an abstract way, which is why it is difficult to get them to participate in innovation procurement. In other words, StartOff is struggling to get enough challenges from the public sector demand side into their competitions. In other countries such as Scotland or Poland, the public actors are queuing up

in order to participate in such competitions. Many of the countries have funding guarantees for the demand side which lowers the burden greatly for participation. If StartOff could have as many interested public actors, then all they would need to do is to screen and evaluate the candidates. However as it is now, they must control themselves not to jump at every opportunity, and still remain operative and retain quality levels. The fact that the demand side has been so slow on the uptake has been both a challenge and a surprise for StartOff. Although the process is both fast and facilitated, there still exists a barrier for public organizations. Many politicians and public figures are talking about how society needs new and innovative solutions. Still, it seems that the public sector struggles with taking the concept of innovation, and breaking it down to manageable, bite-sized problems that can be placed in a PCP-competition.

StartOff believes that a behavioral change is needed. Getting the word out to different public actors has proved rather difficult and resource demanding. StartOff is under the DFØ umbrella, and has to use public channels of communication. Reaching out to startup incubators and entrepreneurial ecosystems is not difficult, and they receive a lot of interest from these actors. However, without an accumulation of challenges from the demand side StartOff cannot open their competitions for a large portion of startups. They have to work the other way around. The main goal is to change the perception that the public sector is slow to work with for startups. But in order to achieve a change of perception from the supplier side, the demand must first be there.

Reconciling Risk and Commitment in Financing Projects

StartOff has worked on financing projects for the public actors in order to reduce the risk for them to participate in the StartOff process. However the down-side to this is that without skin in the game - Without staking resources and time on the competition and partnership with the supplier, then the public procurers are not as dedicated, and are less likely to go through with a procurement at the end of the process.

With their overall goal to match public procurers and startups they have to make sure to increase success rates of each competition. If they don't succeed in that, and either side is unhappy, the subsequent procurement and post R&D phase will fail. However, should the competition up to the MVP phase be a success, the hardest part remains. Going from MVP

into actual implementation with the public actor, and into scale up for the supplier is very difficult.

The role of StartOff as mentioned is that of a matchmaker between demand and supply. However, even though StartOff is technically a part of the Norwegian public sector, they face challenges similar to a startup. They exist “outside the public sector, but still on the inside”. They have to have their finances in order, they have to keep politicians on their side, they need to have their ‘investors’ (DFØ) on their side, and they have to do marketing and storytelling.

Political challenges

StartOff emerged under a previous government, which boasted a dedicated minister for digitalization. However, under the current government, no such ministerial position exists. Consequently, StartOff has lost their political champion, resulting in a challenging environment for garnering political engagement.

The lack of political drive currently requires StartOff to maintain resilience, persisting in their efforts to encourage collaboration. Their focus is on those who need this type of cooperation and on fostering development through the use of their tools. Their mission is to ensure the relevance of their work, making it difficult for the government to dismiss or discontinue their operations.

However, this position presents a unique challenge. StartOff, on their own, lacks the authority to demand recognition of their work's importance and relevance. Instead, they rely on external parties to champion their cause, validating its significance in the eyes of the government. This scenario underscores the need for effective political advocacy and the inherent difficulties faced by organizations operating under changing governmental landscapes.

4.1.1.6 - Leasi - Supplier

Overview

Leasi is a startup company that builds an order management software for machine rentals in the construction industry. They were founded in the beginning of 2022 at the NTNU School

of Entrepreneurship in Trondheim, Norway. In the fall of 2022, they applied to a PCP-competition published by StartOff, wherein the municipality of Oslo was looking to buy a sharing platform for machines and equipment across the 200 public schools in the municipality. After submitting their idea drafts, they were selected as one of three top contestants, who would go on competing for the development of an MVP.

The startup perspective in StartOff's competitions

In addition to the financial resources Leasi received after winning the StartOff competition, they also benefited from the publicity of the competition and has attracted interest from potential customers with similar demands as the municipality of Oslo.

One of the things highlighted by Leasi during the interview was how StartOff proved to be very easy to work with and flexible with their process. As a new company who hasn't gone public with their product yet, Leasi expressed some concerns about the IPR during their publication of the MVP for the Demo Day. In response to this, StartOff made the demo day a closed event. This provided Leasi with a sense of security, which they found very important.

4.1.2 - CivTech - Scotland

4.1.2.1 - Overview

CivTech is a Scottish Government program that aims to solve real problems faced by government departments, public sector organizations, and charities by inviting innovators from various fields to create effective solutions. The initiative serves as a unique opportunity for entrepreneurs, startups, and established businesses to address these issues, gain a customer, and accelerate their business growth. It provides an unprecedented pathway to develop products that the public sector needs.

At the heart of the program is the "Innovation Flow," which is centered around an intensive 15-week Accelerator. Innovative and ambitious teams, selected through an open and straightforward process, are paid to build working prototypes and receive substantial business growth support. The process of applying is designed to be easy, with problems framed as open challenges and procurement streamlined.

For public sector organizations, CivTech provides an avenue to engage with tech and innovation possibilities in a collaborative and cost-effective environment. It offers the freedom to experiment safely and rapidly co-create a solution that the organization needs, aiming to facilitate problem-solving through innovation in a speedy, efficient, and safe environment.³

4.1.2.2 - Role

CivTech takes on the role as a matchmaker and a mediator between public demand and innovative supply sided perspectives. However they have also taken on a role in regulation and have grown to become a strong force of PPI in Scotland. In addition to work as a matchmaker between public demand and supply, CivTech Scotland has also introduced an accelerator stage, where teams meet their cohort members and learn about their respective challenges and solutions. They receive a briefing on the program's structure and expectations for the upcoming weeks. The teams also set out their skills and experience and identify any gaps that may require additional support or mentoring.

In a broader context, CivTech plays a vital role in the development of the civic tech ecosystem in Scotland. By nurturing and supporting innovative startups in the public sector, CivTech contributes to the growth of a vibrant and dynamic ecosystem. They create opportunities for collaboration between startups, government entities, investors, and industry experts, fostering innovation and driving positive change in the public sector.

4.1.2.3 - Function

Articulating demand

CivTech Scotland's core function revolves around addressing real-world problems faced by government departments, public sector organizations, and charities. By inviting anyone with a compelling idea to collaborate, they bridge the gap between problem identification and solution development. This approach fosters a rich environment for innovators, entrepreneurs, and businesses of all sizes to develop products that meet the public sector's needs. They work with the public actors to effectively articulate and formulate problem descriptions.

³ <https://www.civtech.scot/>

CivTech has developed a clear strategy and guidelines for public actors in which to partake in the competitions hosted by CivTech. They have lowered the bar and made a simple four-stage guide to follow for public entities seeking to present a problem in a competition.

Stage 1 - Preliminary Discussion with a Challenge Coordinator - During the initial stage, the public sector entity engages in an informal conversation with a CivTech Challenge Coordinator. The goal is to understand more about the specific issue and any potential solutions that have been explored so far. The Challenge Coordinator explains CivTech's process, potential costs, and jointly decides whether to proceed to Stage 2.

Stage 2 - Challenge-Centric Workshop - Depending on the unique needs of the challenge, CivTech can arrange either an investigative workshop that includes any stakeholders the public sector entity wishes to involve, or a defining workshop. The purpose of these workshops is to aid in the creation of an Expression of Interest form.

Stage 3 - Submission of an Expression of Interest - At this stage, an Expression of Interest form is completed, which captures the fundamental details of any challenge. If the number of submissions exceed available spaces for a cohort, CivTech uses these expressions of interest to filter and select challenges for inclusion.

Stage 4 - Comprehensive Challenge Preparation - After reviewing the expressions of interest, challenges that are selected will work with the CivTech team. The team will help prepare all the necessary documents for publishing the challenges, including a Memorandum of Understanding (MOU) with CivTech, any relevant procurement documents, and videos that highlight the challenges.

PCP as well as Accelerator program

The essence of CivTech Scotland's process lies in its Innovation Flow, a 15-week Accelerator programme. This initiative provides an unprecedented opportunity for selected teams to create working prototypes and receive substantial business growth support. The open and straightforward selection process encourages a diverse range of innovative ideas, making CivTech Scotland a swift, secure, and proven pathway to win public sector contracts.

Tailored for the demand side

For public sector organizations, finding solutions to problems can be challenging. CivTech Scotland provides a solution to this by offering an avenue for these organizations to engage with technological and innovative possibilities in a collaborative and cost-effective environment. This engagement enables organizations to experiment safely and co-produce the solutions they need in a speedy, efficient, and safe manner. This streamlined procurement process is highly beneficial, especially when finding a solution for a problem that is yet to be identified.

Network - Industry and politics

During its early stages, CivTech Scotland had a strong focus on reaching out to industry actors, and innovators on the supply side to start creating the dualistic foundation that is required in successful innovative procurement. Public actors saw that CivTech were reaching a broad network of actors on the supply side which incentivized them to partake in CivTech's earliest competitions. Building these networks of actors across sectors helped CivTech achieve its momentum and grow as an effective arena for PPI through PCP.

4.1.2.4 - Activities

Throughout the course of their lifetime, CivTech has devised a "sales funnel", also known as a purchase funnel, a model that represents the theoretical customer journey towards the purchase of a product or service. The concept is used in marketing to understand and analyze the steps a customer goes through before completing a purchase. The "funnel" metaphor is used because the number of potential customers typically decreases as they progress through the stages of the funnel.

The final part after completion of a successful PCP-competition, is the Demo Day. This is where CivTech arranges an event in order to showcase the results of the competition. This is beneficial for all three parties. The public procurer gets to show that they have the guts to encourage innovation in their organizations. The startup gets to showcase their product and their ability to collaborate in front of potential customers, similar to the public procurer. CivTech gets to show that the process and their organization works as intended, encouraging

more public institutions to partake in the PCP-process and gaining legitimacy as a political tool.

CivTech encourages the public procurers to promote the Demo Days. One way of doing so is by making the public procurers responsible for inviting 20 persons each. This gives the public procurers a sense of ownership about the innovation process.

CivTech Scotland's accelerator program begins with an introduction to the accelerator stage, where teams meet their cohort members and learn about their respective challenges and solutions. They receive a briefing on the program's structure and expectations for the upcoming weeks. The teams also set out their skills and experience and identify any gaps that may require additional support or mentoring.

The workshops cover various topics essential for startup success. The value proposition workshop focuses on helping teams articulate a differentiated benefit to their customers. The mission, vision, and values workshop emphasizes the importance of having a strong strategic plan aligned with a clear set of values. These workshops lay the foundation for subsequent sessions on branding, company narrative, and business modeling.

Agile methodology and continuous delivery workshops provide teams with insights into agile principles and their practical application in product development. Lean startup and growth hacking workshops introduce lean startup concepts and techniques for validating approaches with minimal risk and investment. The program also includes workshops on cybersecurity, accessibility, diversity, and inclusion, highlighting their significance in building successful products and companies.

Throughout the program, teams have regular checkgate meetings with their challenge sponsors and the CivTech team to review progress, discuss challenges, and ensure the best possible start. The one-to-one planning sessions help teams identify the workshops most relevant to their needs and determine areas where additional support may be beneficial.

The program's later stages focus on topics such as investment, presentation skills, financial planning, sales strategy, and international market opportunities. These workshops prepare teams for Demo Day, where they showcase their minimum viable products (MVPs) to potential investors and stakeholders.

Post-accelerator support is also available, with one-on-one sessions and coaching provided in areas such as business planning, selling, branding, growth hacking, content marketing, and investment. The program aims to foster ongoing collaboration and support among the participants, connecting them with the broader CivTech Alumni network.

Overall, the CivTech Scotland Accelerator Programme offers a comprehensive curriculum designed to equip teams with the knowledge, skills, and support necessary for success in the startup ecosystem. By providing a structured framework, mentorship, and access to relevant workshops, the program empowers teams to develop their ideas, refine their products, and build sustainable businesses.

4.1.2.5 - Challenges

CivTech can be characterized as a mature PII, and although they continue to work on challenges they face, much of the challenges faced in the early stages of CivTech have been overcome.

One of the challenges encountered by CivTech Scotland was the need to extend support to startups and SMEs beyond the competition phase. While the initial competition provided a platform for innovative ideas, there was a realization that sustained support was required to help these ventures commercialize and scale their products within the public sector. This challenge highlighted the importance of post-competition engagement and the need to establish pathways for startups to access public sector institutions in other countries.

Recognizing the potential for startups to expand beyond national borders, CivTech Scotland spearheaded the creation of the CivTech Alliance. This pan-national alliance brought together IIs from different countries, fostering collaboration, sharing best practices, and enabling startups to access public sector markets in various jurisdictions. The CivTech Alliance facilitated the internationalization of startups supported by CivTech Scotland, enhancing their opportunities for commercialization and scalability.

4.1.2.6 - CivTech Alliance: Fostering PCP in Global Context

CivTech Scotland has in recent years led a new initiative, creating an organization with goals of diffusing innovation across PIIs globally. This organization is in many ways the next step

for CivTech, and has grown to become one of the first organizations catering to PIIIs in a pan-national perspective.

The Civtech Alliance is a global network of innovation programs across govtech, civic tech, and academia. They currently have teams across 17 countries and their ecosystem integrates the best of government innovation, academic insights, and entrepreneurial efforts. The main goal of the Civtech Alliance is to provide systemic global impact by developing exponential solutions for exponential problems.

The Alliance was formed in Scotland and now has members from Washington D.C. to South Australia. The organization serves as a deep resource for practitioners and academics in the Civic and Gov Tech space, with a strong drive to improve people's lives.

The Civtech Alliance is recognized internationally and has won several awards for their work. They have appeared in main stage sessions at the Creative Bureaucracy Festival in Berlin, featured in the OECD-OPSI report on Delivering and Enabling Impactful Cross-Border Solutions, and won Apolitical's Global Public Service Team of the Year (Climate) 2021 award.

There are several ways to get involved with the Civtech Alliance:

1. **Innovation programme teams:** They can join weekly catch-up calls, participate in the Global Scale-Up Programme, and collaborate in bilateral challenges.
2. **Scale-Ups:** They can apply to the Global Scale-Up Programme which is primarily aimed at scale-ups in the climate tech space, and also contact their regional team for a presentation as part of the Alliance showcase meetings.
3. **Global NGOs:** They can become a strategic partner to the Global Scale-Up Programme and leverage the Alliance's networks for the benefit of their global programmes.
4. **Investors:** They can meet companies that have come through the Alliance's programs and contact regional partners to join the investor sessions as part of the Scale-Up Safari.
5. **Sponsors:** They can support the Global Scale-Up Programme, which provides benefits such as supporting greentech scale-ups on a journey to global impact,

visibility to government policymakers via their cutting-edge innovation programs, and profile at unique global showcases.

Perspectives on PPI challenges in general

In our second interview with Alexander Holt, the founder of both CivTech Scotland and the CivTech Alliance, we spoke about the specific challenges that PIIs face in their different stages of existence. Although PIIs are public initiatives, he highlighted the need for having an entrepreneurial mindset when building them. He also underscored the importance of having political support, and aligning the goals of IIs with the aims of related political initiatives.

Global Public Innovation Intermediary systems

While the CivTech Alliance operates on a global scale, promoting international collaboration and exchange of best practices, CivTech Scotland functions more locally, focusing on fostering innovation within Scotland to solve specific challenges faced by the public sector.

As stated earlier also, the CivTech Alliance, led by CivTech, represents a significant global network of innovation programmes across GovTech, Civic Tech, and Academia, with teams present in 17 countries. This unique ecosystem intertwines government innovation, academic insight, and entrepreneurial endeavor, striving to deliver systemic global impact and solutions for complex problems.

The Alliance's culture is underpinned by an entrepreneurial mindset, emphasizing a perspective of “looking up, out, and across,” rather than “looking down and in.” This outward-looking culture mixing different international perspectives promotes a state of continuous change, innovation, and advancement.

The CivTech Alliance functions as an PII by facilitating the exchange of knowledge and best practices among its members, sourcing and scaling climate tech solutions for global public sector applications, and fostering effective intergovernmental delivery partnerships. It hosts weekly catch-up calls for informal updates and sharing of best practices, and it runs an award-winning cross-border programme, the Global Scale-Up Programme, specifically for climate tech solutions.

The Alliance is not restricted to innovation programme teams; it also provides avenues for scale-ups, global NGOs, and investors to get involved. Global NGOs, for instance, are encouraged to become strategic partners to the Global Scale-Up Programme and leverage the Alliance's network for the benefit of their own global programmes.

Investors, on the other hand, can meet companies that have been through the Alliance's programmes, potentially opening up new opportunities for investment and collaboration. They can also engage with regional partners and participate in investor sessions as part of the Scale-Up Safari, further extending their reach and influence within the network.

In terms of recognition, the CivTech Alliance has garnered numerous awards for its work, reflecting its significant contributions to transforming the way governments operate. The Alliance's collaborative approach, characterized by mutual support and the sharing of strategies, has enabled it to effect change and push new boundaries.

4.1.3 - SiR Amsterdam

4.1.3.1 - Overview

Startup in Residence Amsterdam is an innovative program launched in 2015 by the City of Amsterdam in the Netherlands. The program aims to foster collaboration between startups and the municipality to address urban challenges and develop innovative solutions. The Startup in Residence program typically runs for a period of six months. It begins with the municipality identifying specific challenges or areas where they seek innovative solutions. These challenges can span various domains such as sustainability, mobility, healthcare, social inclusion, and more.

Startups are invited to apply to the program, proposing their solutions to the identified challenges. The application process involves a competitive selection, where a panel of experts evaluates the proposals and selects the most promising startups to participate in the program. Once selected, the startups enter a residency period where they work closely with the municipality. They receive support, mentorship, and access to resources to further develop and refine their solutions. The program also provides startups with access to a network of mentors, experts, and potential customers. SiR Amsterdam works in many ways as a traditional startup incubator.

Throughout the residency period, startups collaborate with relevant city departments, gathering insights, testing their solutions, and adapting them to meet the needs of the municipality and its residents. The goal is to create scalable and sustainable solutions that can be implemented to address the identified challenges.

At the end of the program, startups present their developed solutions to a panel of judges and stakeholders from the municipality. Successful startups may have the opportunity to secure contracts or partnerships with the City of Amsterdam, enabling them to implement their solutions and contribute to the improvement of urban life.

Startup in Residence Amsterdam aims to support innovation, stimulate entrepreneurship, and promote the development of creative solutions to urban challenges. It provides startups with an opportunity to collaborate with a major city government, gain valuable experience, and scale their solutions to other cities or markets. The program also benefits the municipality by tapping into the entrepreneurial ecosystem and fostering a culture of innovation within the public sector.

4.1.3.2 - Role

SiR Amsterdam's role involves screening startups in a tender process. They work with the municipality of Amsterdam and receive tenders based on specific problems throughout the city of Amsterdam and across municipality stakeholders. Startups are screened based on environmental criteria, product efficiency, and innovation height. After a tender has been published, SiR Amsterdam's role is to work as a gatekeeper and mediator between startups and the owner of the problem. After matching startups with public tender, they take the role of an accelerator; tailoring training, mentoring, and structured piloting for the startup in cooperation with the public agent.

4.1.3.3 - Function

One of SiR Amsterdam's core functions is to work with the municipality of Amsterdam to identify demand, and subsequently identify and match the right startup for the tender that is posted. They focus solely on the municipality of Amsterdam.

SiR Amsterdam is a demand-based program. They work across several levels of government, private, and public actors to build networks, source startups, and identify mentors. However,

they are a demand-based program. Their strategy is oriented towards sourcing and identifying specific challenges within the municipality. It can be environmental, logistical, or circular areas of focus. Sometimes there are specific challenges, sometimes there are broader areas of focus. Regardless. SiR Amsterdam identifies these challenges from their colleagues. After the challenges are specified in tenders, tenders are published, and SiR takes the lead on sifting the startups and SMEs that apply to the tender.

The areas within the municipality change from challenge to challenge. Sometimes they look for problems in a specific domain, and sometimes they look at the whole municipality, and across many sectors such as transport, energy, waste management, and water. SiR Amsterdam makes sure not to look for challenges that have too detailed descriptions to them.

When a challenge has been identified, a committee chooses which startups and SMEs that will win the tendering process, and subsequently enter the SIR program incubator where they will receive mentoring, training, and guidance. The program takes about half a year, and throughout the program, there is pilot testing with the public actor. If the piloting is successful the public actor procures the product or service.

4.1.3.4 - Activities

SiR Amsterdam covers a wide range of activities. They engage in the entrepreneurial ecosystem of Amsterdam and work on expanding their networks in order to keep track of new and innovative companies that can create value for the municipality of Amsterdam.

4.1.3.5 - Challenges

SiR Amsterdam has met with great success in the last 7-8 years. They have overcome many of the initial challenges they faced, and have a good connection to the demand side, as well as reaching many startups and SMEs.

4.1.4 - SiR Intergov

4.1.4.1 - Overview

Startup in Residence (SiR) Intergov is an initiative based in the Netherlands that aims to foster collaboration between local governments and startups to tackle urban challenges. The

program originated in the city of The Hague, but now involves various government organizations, including several ministries and the Province of South Holland, all of which work together with startups to increase their impact on social issues. This collaboration is based on a shared ambition to develop innovative solutions to the problems that these organizations face.

The purpose of the SiR program is to invest in startups with the best innovative ideas and assist them in developing their prototypes. If the solutions are successful, the participating government organization has the option to act as a launching customer. This provides the startups with a significant advantage as they are able to test and refine their solutions with potential users.

Participating organizations include the Ministry of the Interior and Kingdom Relations, Ministry of Economic Affairs and Climate, Ministry of Agriculture, Nature and Food Quality, Ministry of Social Affairs and Employment, Province of South Holland, and the municipality of The Hague. They each bring their own unique challenges to the program, such as the use of residual waste for new products, helping people on social assistance find jobs using new technologies, and digitizing SMEs, among others.

Startups are encouraged to join the program due to the benefits it offers, including the opportunity to collaborate with various governments, training, workshops with professional mentors, and access to a broad government network, business partners, events, and a workspace in the impact startup building Apollo 14.

The first round of the SiR Intergov program was reported to be a success, with fourteen startups actively developing their solutions in collaboration with civil servants. The program is continually seeking new startups to tackle a diverse range of challenges

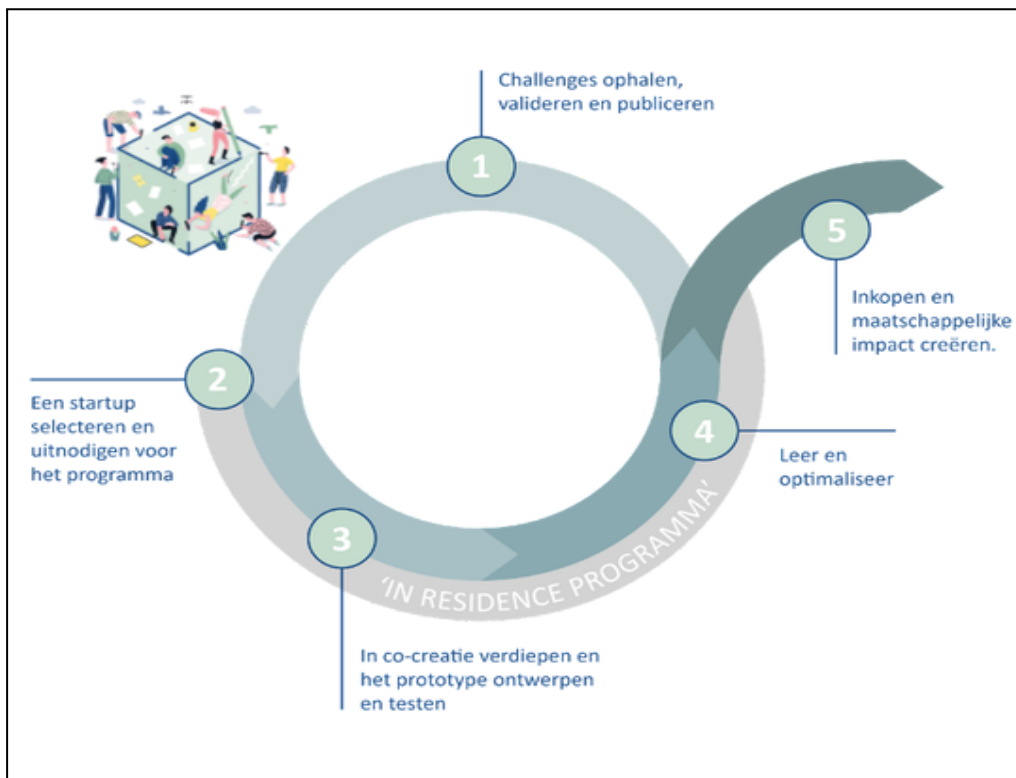


Figure 04: Startup in Residence InterGov programme.⁴

Translation of figure 04:

- 1) Finding, validating and publishing challenges
- 2) Selecting a startup and inviting it to the programme
- 3) Delve into co-creation, designing and testing the prototype
- 4) Learning and optimizing the solution
- 5) Procuring and creating social impact

4.1.4.2 - Role

SiR Intergov works as a matchmaker between startups and procurers in the public sector. For the last three years they have had six rounds of the program. The SiR intergov program has been combined with several other governmental programs that in different ways have sought to match startups and SME solutions to governmental needs. SiR Intergov focuses on spreading the procurement of innovation across several governmental actors, and across different geographical areas across the whole of Holland. They work with both ministries and

⁴ <https://intergov.startupinresidence.com/nl/programma>

municipalities with different jurisdictions and match startups, similar to the SiR Amsterdam program through specified tenders as well as a hybrid model of both training and incubation of startups.

4.1.4.3 - Function

SiR Intergov helps public actors identify specific needs, and creates tenders in which startups can apply. They are screened based on SiR criteria of innovation, team, product, and so on. SiR is a demand oriented intermediary, and the articulation of demand is an important part of their work, helping public actors work together with startups in co-creational processes across several levels over a time of 6 months.

Articulating demand

They work in a hybrid of demand articulation through specific tenders, or with more general areas such as energy, circular economy, or mobility. They either define a tender that has a specific problem and narrow scope, or they source startups under larger problems. If startups have solutions that fall under these broader categories they can still be chosen for the program as the demand side does not always have a clear idea of what they need. That means that SiR intergov does not always have lined up tenders from the demand side, and compensates for that as a general public incubator for startups that has relevant solutions that can be valuable for the public sector regardless of defined tenders. The program is in other words two-sided in a way; On one hand they source startups that can solve problems through defined tenders, or they work to get startups in general closer to the public sector.

SiR Intergov works to breach the knowledge gap and ‘reputation’ and perception of the government as slow or ineffective. Holland, as many other countries, struggles with trust between the general public and the government. Such a sociopolitical divide makes it harder to have startups trust public actors. SiR Intergov works to reverse this phenomenon by taking on an important role of early- or scale-up-stage buyers. Working on intergovernmental levels, SiR Intergov can help startups quickly identify their appropriate partner, as well as diffusing successful corporations and pilots to several cities and areas.

PCP/post tendering process hybrid

SiR Intergov looks for both existing and non-existing solutions. The main goal is to get the startups and relevant public actors to sit together in co-creational processes. The product might be procured, it might not, or it might be procured by another actor within SiR Intergov's sphere of influence. However there is still a tendering process in advance of the different rounds.

In the future, SiR Intergov seeks to continue to develop its boundary spanning tools, and develop conceptual frameworks for co-creation processes in the procurement of innovation. They seek to implement such processes in every step of demand- and public partnerships throughout the project cycles. Their focus is not limited to startups and SMEs and public procurers, but they focus on a wide array of industry actor's, including TTOs, and innovation ecosystems.

4.1.4.4 - Activities

SiR Intergov in its initial stages started out as more of an incubator that matched startups with public actors. However, they seek to move more towards a program where more public actors are linked to the program, working on bridging the gap between the demand and supply side. In addition to this, they are expanding their networks and including more and more of the Dutch innovation networks and entrepreneurial ecosystems. SiR Intergov is moving towards a role where they link several actors, also outside the procurement processes in order to create better and more effective collaborations across domains and organizations. They are identifying how other organizations work with innovation, and create a network of programs and already existing initiatives under a common structure that can be utilized by several actors in order to achieve goals of innovation and problem-solving. During the program cycles, the SiR Intergov program works to mentor and train both sides of supply and demand together in parallel, with a common project as the common denominator.

4.1.4.5 - Challenges

Perhaps the hardest challenge faced by SiR Intergov is to 'innovate the government' - To make public actors more inclined to work with new and innovative actors. They have a team of 'account managers' - or program ambassadors - that constantly work with different public

actors and educate them about the SiR Intergov program. The goal is to reduce the barriers by communicating the benefits of having several actors from the demand side and supply side together in structured processes toward common goals. However, it is difficult to change the culture on both sides.

Changing culture

The dream scenario, which is an ambitious one, and something in which is grounded in SiR Intergov's general role and goals as an effective matchmaker between public demand and innovation - Is to be a force of change in the public domain. They seek to increase the frequency of procurement of innovation, but there is a lot of risk aversion and cultural norms that are difficult to change. A challenge is to identify or develop ambassadors on either side of the chasm between public demand and the supply side. If on one hand, startups and SMEs that have gone through rewarding projects through the SiR program could be strong advocates and 'champions' of co-creational innovation with the public sector - and that on the other hand have civil servants that have experienced the same be equally positive and communicate this in their respective organizations - Then one could start changing the culture. However in order to reach such a level of network effects, and positive autonomous communication of inter-sector cooperation - there has to be more successful initiative and examples to show.

Involving the end user

SiR Intergov works to bridge the gap between public and private, however, a third perspective is emerging as a key concept in SiR Intergov's role as a facilitator. The involvement of the general public in the procurement of innovation. As it is today, SiR Intergov works to succeed as an efficient mediator in PPI, however, their goal is to broaden their scope and involve the end-user in their co-creational processes.

5.0 - Analysis and Discussion

In the subsequent section, we delve into an in-depth examination surrounding our gathered findings. Primarily, our analysis focuses on our case studies where we apply our theoretical framework to distinguish their unique dynamics and operations. Following the individual case analysis, we explore the cases collectively through a cross-case analysis, drawing comparisons and contrasts that offer broader insights into their roles and practices.

Central to our thesis, and in answering our first research question - *What characterizes public innovation intermediaries that work with pre-commercial procurement processes?* - we initiate a discussion on the distinctive characteristics of public innovation intermediaries engaged in pre-commercial procurement processes. We strive to pinpoint the traits and features that define and differentiate these entities, shedding light on their unique methodologies and the factors that contribute to their effectiveness.

Progressing with our exploration, we turn our focus to the obstacles and challenges faced by these PIIs. Responding to our second research question - *What are the challenges public innovation intermediaries that work with pre-commercial processes are facing?*- we seek to identify the hurdles these PIIs encounter within the realm of PCP processes and delve into potential strategies for addressing these challenges.

The subsequent sections of our discussion delves into a conceptual discussion. Looking at the resemblance between the operation of an PII and a startup. Expanding on this, we draw upon entrepreneurial theory as a unique suggestive and exploratory lens through which we can better understand and optimize the functioning of PIIs.

Towards the end of our analysis, we discuss the concept of the CivTech Alliance - an association of PIIs from various countries committed to fostering cross-border innovation and facilitating knowledge sharing amongst a group of international PIIs. We propose that future research could view the CivTech Alliance as a standalone entity, offering further insights into the dynamic interplay between different PIIs within a shared network.

5.1 - Per Case Analysis

In this upcoming section, we will conduct a detailed investigation of each case, utilizing our theoretical framework as the key instrument to dissect, understand, and compare the operations of our selected PIIs in an explorative manner. This will enable us to scrutinize how each intermediary aligns with our framework and how they vary in their approach toward PCP processes. As discussed in the theoretical framework, three core functions will be used to identify characteristics of the PIIs we investigated:

- Demand articulation
- Boundary spanning
- Transferring of innovation and appropriation

Our intention is to offer an in-depth understanding of each PII's distinct operational dynamics, laying the foundation for a comprehensive cross-case analysis to follow. As we dive into the individual examination of StartOff, CivTech Scotland, and SiR (Amsterdam and Intergov), we aspire to shed light on the practices that differentiate each case and yet connect them in the realm of public sector innovation.

With this approach, we aim to produce an insightful analysis that uncovers the unique characteristics of these PIIs, thus contributing to a more nuanced understanding of how they work within PCP processes.

5.1.1 - StartOff Individual Analysis

5.1.1.1 - Role

At its core, StartOff serves as a bridge, facilitating critical interactions between public procurers and innovative suppliers such as startups and SMEs. Its primary objective is to match public sector needs and buyers with the innovative solutions offered by these suppliers, tackling challenges faced by the public sector.

To achieve this, StartOff not only relies on conventional methods of interaction and facilitation, but it also exhibits a deep understanding of the public procurement regulation. The organization identifies the prevailing limitations and obstacles in the current procurement

regulations, the lengthy tender processes, price competition, complex project timelines, and skillfully maneuvers around them.

This innovative approach to identifying and exploiting regulatory gaps plays an instrumental role in their operations. They exploit the pre-tender phase, where competition and innovation can be judged on different factors like the viability of the idea, the strength of the team, and the potential of the technology. By hosting competitions tailored to future tenders, they essentially create a platform where innovative solutions can be assessed and recognized, long before the official tendering process begins.

In essence, StartOff's role as a PII extends beyond just bridging gaps. They demonstrate a proactive approach to shaping the environment within which they operate. They modify their approach to match the regulatory conditions, thereby supporting innovation and ensuring that even young, inexperienced startups have an opportunity to contribute to public sector solutions. Their role, therefore, is not only to facilitate but also to interpret, adapt, and ultimately, enable.

Policy and Guidelines

StartOff works in conformity with Norwegian procurement regulation, which is harmonized with the European Union through the European Economic Area. Such regulation exists to ensure fairness, transparency, and competition in public procurement. However, as we have identified, the rules make it hard for both the demand and the supply side in working with new innovative products and services. StartOff's niche is to facilitate the pre-commercial procurement process before the tendering process. This allows demand side actors to formulate and articulate specific problem descriptions, which StartOff then publishes through one of their competitions. At this stage there is no procurement involved - StartOff handles the financial incentives for the startups. When a startup goes through the competition, StartOff handles the R&D face up to an MVP stage for the startup and ensures that the public actor is involved in the R&D process. At the end of the PCP phase, the product made by the startup fits well with the problem and needs of the public actor. Now the tender is posted, and the tender is based on the initial problem description for the competition. That makes the developed product perfect for the tender, and the public actor has been a part of the journey - Which means the risk of purchasing a new product is significantly lower.

5.1.1.2 - Demand Articulation

One of StartOff's core functions is to articulate public sector demand. This directly aligns with the core concept of demand articulation in our theoretical framework. StartOff translates the complex needs of the public sector into a language and format that startups and suppliers can comprehend. They draft the demand from the public sector and convert it into a more technical domain, making it easier for suppliers to understand and meet the requirements.

Bridging the Gap

As explained, StartOff serves as a bridge between the public sector and startups. This involves facilitating knowledge exchange, which is a crucial aspect of demand articulation. The knowledge generated and disseminated by StartOff improves the understanding of both parties involved, enabling them to better align their efforts. StartOff has during its three years in operation observed what types of problem descriptions work best. Working with the public actors, StartOff makes sure that the description for a specific problem is clearly defined for the startups. This process resonates with the view of Howells (2006), Klerkx and Leeuwis (2009), Stewart and Hyysalo (2008), and Smits et al. (2010) on the role of intermediaries in knowledge generation and dissemination.

Risk Reduction

By handling project management, addressing competence needs, and ensuring transparency, StartOff minimizes the risks associated with public procurement for both the public procurers and the suppliers. This action streamlines the innovation procurement process, making it more efficient and reliable. It is important to create an environment in which public actors feel that innovation-creation processes are beneficial to their everyday tasks. Many civil servants have tasks that require their full attention, and they are constantly monitored as public entities. Having the reassurance that the innovation process itself is tailored and that StartOff works as the translator and facilitator, lowers the bar for the demand side to participate in PCP.

Building Competence and Knowhow

Another aspect of demand articulation involves the identification of needs and requirements. StartOff works with both suppliers and procurers to identify and address competence gaps, contributing to a more effective and successful procurement process. The accumulated knowledge compiled after each successful PCP competition held by StartOff with actors across domains builds competence and know-how, that in turn provides learning for both parties, as well as StartOff itself.

Learning and Exploring Across Multiple Dimensions

We have found that StartOff adopts a multidimensional approach to learning and exploration as they navigate the challenging terrain of public sector innovation. Our interview with StartOff has revealed how they work relentlessly to enhance the knowledge and practices within their team.

One of the key strategies they employ is the development of their team in terms of both size and diversity of backgrounds. They put great emphasis on maintaining an interdisciplinary team equipped with various perspectives, believing that this diversity fosters creativity and a more holistic understanding of the challenges they face.

Experimentation is also central to StartOff's learning approach. An example of this is their initiative to cold call public sector actors when looking for potential problems to include in their Pre-commercial Procurement (PCP) competitions. This bold strategy allows them to directly engage with the public sector and gain first-hand insights into their needs.

In order to preserve and build upon their knowledge and experiences, StartOff develops toolkits and frameworks. These tools serve as repositories of acquired knowledge, and also guide future actions, enabling a continual process of learning and improvement.

Such strategies are crucial for StartOff in overcoming obstacles they face, such as risk aversion in the public sector, a shortage of demand-side projects and problems for their competitions, and limited awareness about their services. By continually learning and adapting, StartOff is better equipped to meet these challenges and further its mission of bridging the gap between startups and the public sector.

5.1.1.3 - Boundary Spanning

StartOff builds strategies across actors, sectors, and markets. Their current PCP framework is influenced by templates from Scotland and Baltic countries but is adapted to fit the Norwegian market and regulatory system. This suggests a boundary-spanning approach as they adopt international best practices and adjust them to fit the local context. The PCP framework presented by StartOff can only work if StartOff ensures that the process is tailored to the Norwegian context - both for the supplier and the demand side benefit. If PIIs are to learn from each other, share tools, and take inspiration, then one of the most important functions of the PII is to ensure that the innovation processes work in the national, municipality, or regional context.

Engaging Diverse Actors:

StartOff works with a variety of actors, agents, and procurers, bridging the gap between these stakeholders and the suppliers of innovation like startups and SMEs. By doing so, StartOff acts as a bridge, spanning the boundary between these diverse actors and enabling collaboration. StartOff works to ensure that a wide variety of stakeholders are well-informed, educated, and trained in the processes of StartOff's competitions and innovation processes. Not only are the suppliers and the demand perspective in focus, but industry, politicians, incubators, accelerators, and universities are included as important stakeholders.

Navigating Trends and Issues:

StartOff takes into account political and societal trends such as sustainability, green transition, and digitalization. By aligning their process with these broad trends, they connect their work to larger societal and global contexts, spanning the boundary between the local and the global, and between the technical and the societal. Especially now, StartOff works as an important tool for civil servants who are tasked with ambitious goals within domains such as sustainability and digitalization. StartOff is an important link between societal challenges and those who seek to innovate. An important function, however, which is less discussed today is to have actors that work to understand how technological and societal trends correlate. Navigating these trends, and placing them into a context of mutually beneficial understanding and cooperation makes StartOff a great tool for innovation.

Innovation Procurement:

StartOff engages in a process designed for more limited issues with shorter project length and smaller contract amounts. This process allows for the development of an MVP within 18 weeks. Through this approach, StartOff spans the boundary between traditional procurement practices and the dynamic and agile practices common in startup innovation, acting as a bridge between these two different domains.

Creation of Networks

During the last two years, StartOff has attended the startup event 'Startup Extreme' in order to expand their networks and become known. StartOff's experience with Startup Extreme exemplifies the critical role of network creation and its challenges. While the event was a great experience, the lack of public sector actor engagement shows a potential gap in the network creation process. This highlights the significance of a tailored, comprehensive network that incorporates all the relevant stakeholders, from startups to public sector actors, for successful innovation procurement.

The feedback on the event leaning more towards investors than public security and demand innovation also underscores the need for a balanced network. Such a network should foster an environment where all actors can communicate effectively, contributing their perspectives, needs, and capabilities to the innovation process. In this context, StartOff seems to take on the role of an advocate for a more inclusive network that caters to the demands of the public sector, thus expanding the network beyond its current boundaries.

Moreover, the narrative indicates that StartOff is also engaged in learning and improving from its network-building experiences. This iterative learning process reflects the concept of network building leading to exploitative innovation, as mentioned in De Silva, et al. (2022).

StartOff is actively participating in network-building activities, there is a recognized need for these networks to be more inclusive and tailored towards fostering collaboration between public sector actors and startups. The lens of the creation of networks can be instrumental in guiding their future efforts in creating and facilitating more effective professional networks.

It is difficult, however, to look at a single example when attempting to understand the value of network formation within StartOff. StartOff works every single day to expand its network.

In many ways, it can be seen as a direct activity under boundary-spanning activities. In order to better understand how StartOff works with expanding their networks one should take a deeper look at their day-to-day activities over time. Using the lens of network formation feels redundant, as creating networks is considered a baseline task in any organization such as StartOff.

5.1.1.4 - Transferring of Innovation and Appropriation (IPR)

It is important for StartOff to maintain a sense of security for young startups through strong contracts and IPR. In the development phase, testing, and subsequent procurement phase, the supplier must be assured that their knowledge, product, and trade secrets are taken into account. StartOff's role as a mediator between the demand side, and the supply side must take into account both the transferring and appropriation of innovation. One instance of this function is highlighted by Leasi, the startup we interviewed. Leasi had concerns about sharing their product with competitors. Hence, StartOff changed the public presentation format when Leasi were to present their solution for Oslo Kommune. This is an example of how StartOff leverages the needs of demand and the supply side, and adapts to protect the startup's sense of security.

5.1.2 - CivTech Scotland Individual Analysis

5.1.2.1 - Role

CivTech Scotland operates as a critical link or mediator within the Pre-commercial Procurement (PCP) framework, serving as a conduit between the demands of the public sector and the innovative offerings of startups and SMEs. Their primary objective revolves around addressing the challenges inherent to the public sector by harnessing the power and potential of innovation.

CivTech's role, however, extends beyond the scope of basic mediation. They have become an influential regulatory entity within Scotland's public procurement of innovation landscape. Through their established reputation and strategic initiatives, they wield considerable influence, actively shaping the direction and outcomes of PPI within the region.

An example of CivTech's extended role is their innovative implementation of an accelerator stage within the procurement process. This unique stage provides an opportunity for startups to interact with their peers, gain insights into the program's structure and expectations, and identify areas where additional support or mentoring might be required. This accelerator stage underscores CivTech's role as a facilitator, ensuring that startups are well-prepared and equipped to offer optimal solutions to public sector challenges.

In a broader context, CivTech plays a pivotal role in cultivating a vibrant civic tech ecosystem in Scotland. Their work extends to fostering collaborations between diverse stakeholders such as government entities, investors, and industry experts. By facilitating these collaborations and providing support to innovative startups, CivTech functions as a catalyst for impactful change within the public sector. Therefore, the role of CivTech within the PCP framework is multi-faceted, spanning mediation, regulation, mentorship, facilitation, and ecosystem development.

Policy and Guidelines

Similar to StartOff, CivTech Scotland has created a Pre-commercial procurement-competition in conformity to the Scottish procurement regulation, which is harmonized with the European Union. The PCP-competition is then published through Public Contracts Scotland, as an open call for all contestants.

5.1.2.2 - Demand Articulation

One of the most important roles of CivTech is the function of translation between demand and supply. As a seasoned veteran in the procurement of innovation sphere, they have worked out an effective system for demand articulation on the demand side. Their role has grown to that of a 'market leader' - if such a word can be applied - in the Scottish public sector when it comes to identifying problems, and matching startups with public actors. Entering their ninth competition stage, their methods have been tried and proven effective. Their four-stage 'onboarding' of public demand actors share similarities to that of an onboarding process for a startup or company engaging with customers. They make sure the process is easy to understand and maintain a clear structure with progressive steps toward an end goal. It can be argued that once you have a streamlined process for onboarding demand actors into your PII

you have succeeded in creating a system where public demand articulation is at the center of progressive, cross-sectoral innovation and creation.

5.1.2.3 - Boundary Spanning

CivTech has had an early focus on boundary-spanning activities, making sure to involve industry actors from the start, as well as the demand side in the public sector. As a seasoned PII, such activities have become a natural part of CivTech Scotland's daily activities - In other words, CivTech has established itself as a highly effective multi-stakeholder PII with a strong reputation, and a good 'pipeline' of competition and challenges.

Creation of Networks

CivTech Scotland is a prominent organization in the Scottish landscape of innovation procurement. As an established public innovation intermediary, CivTech Scotland has successfully formed comprehensive professional networks and is recognized throughout the Scottish government. The organization maintains an active presence on social media platforms, namely LinkedIn and Twitter, and utilizes these channels to disseminate information about the program's success stories and notable achievements. Beyond this, CivTech Scotland has designed a set of tools to aid in the interaction with demand-side actors. These tools provide guidance on various aspects of communication, from the initial approach to conveying key messages, enhancing the efficiency of engagement processes.

5.1.2.4 - Transferring of Innovation and Appropriation (IPR)

CivTech Scotland is currently preparing its ninth competition cycle. They have strong standards for maintaining security and transparency on behalf of the suppliers that participate in the CivTech Scotland challenges.

During its most recent stage (CivTech 8), CivTech has employed an accelerator stage of its standard competition cycles. Marking CivTech Scotland as an PII that works with PCP, but also employs learning and guiding as a standard accelerator. Not only does CivTech facilitate joint collaboration and development between demand and supply, but they help the supply side grow by providing workshops, mentors, and other activities to boost their entrepreneurial journey.

5.1.3 - Startup in Residence

5.1.3.1 - Roles

SiR Amsterdam, within the Pre-commercial Procurement (PCP) framework, adopts a multi-faceted role. They operate as screeners, gatekeepers, mediators, and accelerators. They are actively involved in soliciting tenders based on specific problems faced by various entities across the city of Amsterdam. They implement an intricate screening process for startups, evaluating them on several factors such as environmental impact, product efficiency, and the level of innovation.

Once tenders are published, SiR Amsterdam transitions into the role of a gatekeeper and mediator, bridging the gap between startups and the problem owners. Post the matchmaking process, they adopt the mantle of an accelerator. They offer tailored training, mentoring, and structured piloting to startups in collaboration with public agents. Thus, SiR Amsterdam embraces a multi-pronged role that is vital in orchestrating successful matchmaking between public sector demands and innovative solutions from startups.

SiR Intergov, similar to SiR Amsterdam, functions as a matchmaker, aligning the innovative prowess of startups with the needs of public procurers. Over the past three years, they have carried out six rounds of their PCP-challenge cycles, each time interfacing with numerous governmental bodies and stimulating the procurement of innovation. Their purview extends across geographical barriers, encompassing the entirety of Holland. SiR Intergov also engages with a variety of government entities, from ministries to municipalities, each with its own unique jurisdiction.

Similar to the SiR Amsterdam program, SiR Intergov operates through specified tenders. However, they also incorporate a hybrid model that combines training and incubation of startups. Therefore, in the PCP framework, SiR Intergov takes on the role of a matchmaker, trainer, and incubator, fostering an environment conducive for innovation to thrive and meet public sector demands.

5.1.3.2 - Demand Articulation

Articulating Demand

The SiR program starts by the City of Amsterdam clearly identifying the specific challenges and areas where they need innovative solutions. These challenges are articulated and communicated in a way that the startups can understand and respond to. This reflects the crucial aspect of demand articulation, as defined by Kivimaa (2014), where the intermediary translates the public sector's demand into a more startup-friendly language. Similarly to SiR Amsterdam, SiR Intergov takes on the role of translating the needs of public actors into specific tenders or broader problem areas, which startups can understand and respond to. This activity resonates with the demand articulation process as defined by Kivimaa (2014), where intermediaries translate public demand into a language that fits within the technical and innovative realm of startups.

Bridging the Gap

The SiR, both Amsterdam and Intergov, acts as an intermediary, bringing startups and the municipality together. SiR Amsterdam provides a platform for startups to work closely with the municipality, fostering a collaborative environment and facilitating knowledge transfer between both parties. The residency period and the close collaboration with relevant city departments reflect the role of intermediaries in knowledge generation and dissemination. SiR Intergov works to bridge the knowledge and trust gaps between startups and public actors across several areas of the Dutch public sector. It takes a proactive role in reversing the perception of the government as slow or ineffective, thereby fostering a more collaborative relationship on a broader geographical and governmental scale. Link to analytical framework - as proposed by Howells (2006), Klerkx and Leeuwis (2009), Stewart and Hyysalo (2008), and Smits et al. (2010).

Risk Reduction

The SiR program minimizes the risks for both startups and the municipality by providing support, mentorship, and resources to the participating startups. This support and mentorship help build competence and know-how among startups, aligning with the demand articulation perspective of identifying needs and requirements. The process reduces the barriers that

typically hinder startups from engaging with the public sector, which also aligns with the risk reduction aspect of the demand articulation.

Encouraging Innovation and Promoting Solutions

The SiR program seeks to promote creative and innovative solutions to urban challenges. It encourages the startups to refine and adapt their solutions to meet the needs of the municipality and its residents, which directly ties in with the concept of demand articulation. The end of the program presentation also provides a platform for startups to articulate their developed solution's value, meeting the demand of the municipality.

5.1.3.3 - Boundary Spanning

Cross-Sectoral Collaboration

Both SiR Amsterdam and SiR Intergov work across several levels of government and with both private and public actors. They build networks, source startups, and identify mentors, demonstrating their role as a boundary-spanning entity connecting different sectors and stakeholders.

Flexible Strategy Orientation

SiR Amsterdam's strategy is demand-based and oriented towards sourcing and identifying specific challenges within the municipality. These challenges can vary from environmental to logistical issues, or have a broader focus such as circular economy. The ability to pivot and respond to diverse demands signifies a boundary-spanning role, transcending the confines of specific sectors or challenges. SiR Intergov, despite its relatively recent establishment, demonstrates a commitment to iterative strategic evolution. A key element of their approach is embracing a dynamic strategy formation process that adapts to changing circumstances, stakeholder needs, and the overall innovation landscape. This constant re-iteration of strategy is a hallmark of their boundary-spanning role; by refusing to remain static or confined within established paradigms, SiR Intergov expands its reach, understanding, and effectiveness across a variety of domains and sectors.

Moreover, their strategy development process mirrors their role as a facilitator of innovation procurement. They acknowledge that the pathway to innovation is rarely linear and often

requires adjustments and pivots along the way. Similarly, their strategic development is iterative and receptive to feedback, allowing them to learn from experiences, adapt their approaches, and continuously refine their methods and practices.

The evolving nature of SiR Intergov's strategy formation is indicative of its intention to expand its boundary-spanning capabilities. By maintaining a fluid, flexible strategy that adapts to changes and new insights, they are better equipped to bridge gaps, connect diverse actors, and facilitate the procurement of innovation in a more effective and efficient manner. This willingness to evolve and adapt is crucial in their mission to foster and accelerate innovation procurement processes.

Open Approach to Problem Identification

SiR Amsterdam's approach to problem identification spans boundaries as it can look for problems in specific domains or across the whole municipality and across sectors such as transport, energy, waste management, and water. They intentionally avoid overly detailed challenge descriptions, demonstrating an ability to span different domains and sectors within the municipality. SiR Intergov does not limit their focus to startups and SMEs and public procurers. They also engage with a wide array of industry actors, including Technology Transfer Offices (TTOs) and other components of innovation ecosystems, indicating a capacity to span boundaries between different types of organizations.

Procurement Strategy

SiR Amsterdam engages in a competitive tendering process, followed by an incubation program for chosen startups and SMEs. This process spans the boundary between traditional procurement practices and the dynamic, innovative practices common in startups and SMEs. They offer mentorship, training, and guidance, further assisting these entities to navigate the complexities of public sector procurement. SiR Intergov is not confined to seeking existing solutions; they are also on the lookout for potential, non-existing solutions. This spans the boundary between the current state of affairs and the realm of possibilities.

Creation of Networks

Creating professional networks is an important part of SiR Amsterdam, and SiR Intergov. SiR Amsterdam mainly focuses on the municipality of Amsterdam and focuses on the local entrepreneurial ecosystems, as well as the public actor stakeholders.

SiR Intergov, has a slightly broader perspective, and works on building a network of stakeholders that spans the national/regional level of the Netherlands. This makes the process of network formation and development challenging as the stakeholders are less centralized.

Looking at the two cases of SiR organizations, the creation of networks as an analytical lens can be an effective tool in identifying the differences in needs to overcome challenges in building networks.

5.1.3.4 - Transferring of Innovation and Appropriation (IPR)

The process at SiR Amsterdam, where startups enter a program incubator and engage in pilot testing with public actors, can be viewed in the light of transferring of innovation. The pilot testing phase, in particular, is akin to prototyping and piloting, allowing the startups to adjust and refine their innovation in a real-world setting.

Moreover, the committee selection and subsequent incubation process mirrors the principle of gatekeeping and aligning, where a knowledgeable entity assesses and selects promising innovations, provides guidance and mentoring, and helps align the innovation with public sector needs. While specific activities related to IPR such as patenting and licensing support aren't explicitly mentioned, the context suggests that SiR Amsterdam facilitates a safe and structured environment for startups to develop, test, and potentially commercialize their innovations.

SiR Intergov's approach of helping public actors articulate specific needs and creating corresponding tenders reflects elements of technology assessment and evaluation. Through screening startups based on their innovation, team, product, and other criteria, SiR Intergov serves as a gatekeeper, assessing the potential of these innovations to meet public sector needs.

Their focus on co-creation further illustrates a mechanism for transferring innovation. By facilitating the interaction between public actors and startups, they allow a seamless flow of ideas and knowledge, creating an environment conducive for innovation to be molded, adapted, and refined in response to articulated needs.

Piloting and Procurement:

SiR Amsterdam further demonstrates boundary spanning by facilitating pilot testing with public actors. Successful pilots may lead to procurement by the public actor, bridging the gap between innovation development and its practical implementation within the public sector. SiR Intergov aims to bring startups and relevant public actors together in co-creational processes, blurring the boundaries between different types of organizations and enabling mutual learning and collaboration. The end result of the co-creation process is not predefined, reflecting SiR Intergov's flexibility in spanning boundaries. The product might be procured, it might not, or it might be procured by another actor within SiR Intergov's influence. In the future, SiR Intergov aims to further develop its boundary-spanning tools, creating conceptual frameworks for co-creation in the procurement of innovation. This commitment indicates a focus on fostering deeper integration and collaboration between various stakeholders in the innovation ecosystem.

5.2 - Cross-Case Comparison and Discussion

This section of our thesis embarks on a critical journey through cross-case analysis, which allows for a comprehensive understanding of the commonalities, contrasts, and unique aspects across our different cases. Our focus in this section is to unravel the distinct characteristics of PIIs that work with Pre-commercial Procurement (PCP) processes. This approach not only provides a more robust and nuanced understanding of PIIs involved in PCP processes, but also bolsters the generalizability and transferability of our findings. Our goal for this section is to answer the first research question (RQ 1):

What characterizes PIIs that work with PCP processes?

In striving to address this question, we delve into the roles, functions, and activities of PIIs, offering an in-depth view of their operations, contributions, and unique positioning within the broader landscape of public sector innovation.

This cross-case analysis and subsequent discussion will pave the way for a thorough and nuanced exploration of PIIs, allowing us to highlight their intricacies and complexities in ways that single-case studies might overlook. As we unpack these findings, we hope to offer not only a clear snapshot of current practices but also fresh insights and implications for policy, practice, and future research.

5.2.1 - Comparing the Roles of our Cases

Across all cases, it is evident that each organization operates as a matchmaker or mediator between public procurers and innovative suppliers. They all share the overarching goal of bridging the gap between public sector demands and the innovative solutions provided by startups and SMEs. This commonality lies in their shared objective of addressing the issues in public sector procurement by introducing more innovative, efficient solutions to the public sphere.

Yet, nuances become apparent when we delve deeper into the specifics of each case. There are operational differences in the way the PIIs are organized. For instance, StartOff's approach is unique due to its focus on exploiting loopholes in the pre-tender public procurement regulation. They specialize in fostering an environment that values and rewards the entrepreneurial spirit and ingenuity of startups in their pre-tender phase.

CivTech Scotland, on the other hand, goes beyond matchmaking and has incorporated a regulatory role. It has become a powerful force for public procurement of innovation in Scotland. Moreover, CivTech offers an exceptional pathway for businesses to develop much-needed products for the public sector, promoting both the growth of these enterprises and the advancement of public goods.

SiR Amsterdam operates primarily as a gatekeeper in their tender process, meticulously screening startups based on environmental criteria, product efficiency, and innovation height. Furthermore, once a startup is matched with a public tender, SiR Amsterdam morphs into an accelerator, providing targeted training, mentoring, and structured piloting in cooperation with the public agent.

Similarly, SiR Intergov focuses on the matchmaking role but places significant emphasis on disseminating the procurement of innovation across several governmental actors and

geographical regions throughout Holland. They maintain collaborative relationships with various ministries and municipalities with different jurisdictions, aligning them with startups via specified tenders, and offering a hybrid model of training and incubation for these startups.

5.2.1.1 - The Role of PIIs in Transforming Public-Private Collaborations

In order to further expand upon the discussion of the roles of PIIs, we will also present Alexander Holt's perspectives on how to transform the relations between public procurers and private suppliers in PPI. CivTechs vision hinges upon eight key transitions within public-private collaborations, which can significantly enhance the quality and impact of these partnerships. This chapter delves into each of these transitions, discussing their importance, implications, and potential outcomes.

From Value Extraction to Value Creation

Traditional PPI have often been criticized for emphasizing value extraction, focusing on what each partner can gain independently. CivTech suggests a shift towards value creation, a more sustainable and mutualistic approach. In this context, both public and private sectors contribute to a shared purpose that benefits not just the partnership, but also wider society. This could potentially lead to new innovative solutions that address societal challenges while generating shared economic prosperity.

From Discussion to Dialogue

CivTech proposes transitioning from discussions to dialogue, which entails moving from a one-way, transactional communication to a two-way, transformative interaction. Dialogue enables the equal participation of all stakeholders, enhancing mutual understanding, fostering empathy, and ultimately enabling the co-construction of shared meanings and agreements.

From Risk Aversion to Risk Receptiveness

Civtech believes in the necessity of shifting from risk aversion to risk receptiveness. This means encouraging an openness to calculated risk-taking, leading to greater innovation and

potential progress. It implies cultivating an environment where mistakes are perceived as learning opportunities rather than failures.

From Consultation to Co-creation

The next transition involves moving from consultation to co-creation. Instead of merely consulting private entities for their input, public sectors would work collaboratively with private entities to develop solutions. This approach promotes a more participatory and inclusive process, enhancing the potential for innovative and comprehensive solutions.

From End Points to Journey of Continuous Improvement

Civtechs model replaces the concept of definitive end-points with a journey of continuous improvement. This entails an ongoing commitment to refining and enhancing the outcomes of PPIs, allowing for the adaptation and evolution of solutions in response to the ever-changing socio-economic landscape.

From Closed and Private to Open and Transparent

Transparency and openness form the basis of the sixth transition. Encouraging a shift from closed-door meetings and private decisions towards a more open and transparent model, which promotes accountability, builds trust, and fosters a more inclusive engagement with all stakeholders.

From Pre-supposing the Solution to Understanding and Articulating the Problem

In contrast to imposing pre-determined solutions, CivTech advocates for a comprehensive understanding and articulation of problems before exploring potential solutions. This approach ensures that solutions are more tailored and responsive to the actual issues at hand.

From Unconscious Acceptance to Conscious Curiosity

Finally, Holt suggests a transition from unconscious acceptance to conscious curiosity. This means fostering an environment where stakeholders actively question, explore, and seek better understanding, thus promoting innovative thinking and avoiding complacency.

CivTechs vision for transforming PPIs and public-private collaborations presents an innovative and compelling roadmap for enhancing these crucial interactions. Each of these transitions embodies a fundamental shift in approach and attitude, encouraging more inclusive, collaborative, and innovative PPIs. Embracing these transitions could potentially usher in a new era of public-private collaborations, characterized by shared prosperity, sustained innovation, and broad societal impact. Future research should further explore the practical implications of implementing these transitions, contributing to an expanding discourse on effective and impactful public-private collaborations.

In summary, while each entity shares the fundamental role of a matchmaker, the ways they navigate and operate within this role vary, exhibiting unique approaches and strategies tailored to their respective contexts and objectives. These variations, in turn, influence the overall efficiency and impact of their operations.

5.2.2 - Functions of Public Innovation Intermediaries

5.2.2.1 - Demand Articulation

One characteristic which is clear across the PPIs we have looked at, is that they all function as a translator between the demand side, and the supply side. In their role as the matchmaker there follows a responsibility to help either side communicate effectively - This involves for StartOff to assist the demand side in formulating problems that the suppliers can easily understand. Problem formulations can not be too broad or vague. When the problem has been narrowed and specific enough, StartOff posts it in one of their challenges. Startups and SMEs are then screened and a winner is chosen. Then the PCP stage is begun, and StartOff facilitates the collaboration between the suppliers and the demand side in the R&D stage. When the PCP process is complete, the demand side will formally post a tender that is closely related to the initial problem description entered into the PCP process with StartOff. The supplier will then have an ideal standing in winning the tender. CivTech Scotland works in much the same way. This is not a surprise as the StartOff competitions, and their PCP processes are based on CivTech Scotland's models.

SiR Amsterdam and SiR Intergov work in a little different way when it comes to articulating the demand of the public actors. They work with the tendering process as the guide for the supply side to tackle. Through a SiR tendering 'template' they articulate the demand side

problems together with the relevant public actor. They then post the tender and invite startups and SMEs to send in their solutions. Suppliers are then screened, and winners go through to the accelerator phase which involves mentoring from SiR, as well as joint cooperation in tuning their product along with the demand side through pilots.

Although there are some differences between the demand articulation amongst StartOff and CivTech Scotland, and SiR Intergov and SiR Amsterdam they all work to bridge the gap between demand and supply side. There are never any guarantees that the suppliers winning the StartOff/CivTech Scotland competitions - or the SiR Amsterdam/Intergov tenders - will have their product or service procured. However, due to the facilitated process managed by the PII the outcome very often ends in a final procurement of innovation.

5.2.2.2 - Boundary Spanning

As identified, the role of the PIIs is to work as a matchmaker between supply and demand. However, each of the PII we have looked at belongs in a multi faceted world, and have to include a wide variety of industry actors, private sector stakeholder, civil servants, ecosystems, and political landscapes into their processes. Managing, and understanding different stakeholders is one of their most important functions as PII. Boundary spanning activities is an integral part of each of the PII. We have interviewed, and they share great similarities in this regard. Although each innovation system and public/private landscape is a little bit different from country to country, the core of it remains similar across all cases.

However, as we further analyze the cases, we recognize a significant overlap between the activities classified under 'creation of networks' and 'boundary-spanning'. This leads us to question if the 'creation of networks' lens is the most effective way to characterize IIs.

The tasks often considered as network creation—engaging with various stakeholders, expanding connections, maintaining active communications—are intrinsic to the boundary-spanning activities of these intermediaries. This realization opens a broader discussion about the distinctiveness and utility of 'creation of networks' as a separate analytical lens. It suggests the need for a more nuanced understanding of these categories, to prevent redundancy and provide a more accurate characterization of PIIs.

5.2.2.3 - Transferring of Innovation and Appropriation

In this section, we perform a cross-case analysis, focusing specifically on how our cases—StartOff, CivTech Scotland, SiR Amsterdam, and SiR Intergov—handle the crucial aspects of transferring innovation and appropriation (IPR). As we examine the instances from each case, we find an underlying commonality in their strategies to secure the innovation process, albeit achieved in unique ways.

All four cases evidently recognise the vital need for security and protection of the intellectual property (IP) for participating startups. For instance, StartOff and CivTech Scotland both employ strong contracts and safeguarding measures to ensure the security of a startup's IP. StartOff has demonstrated flexibility in adapting its practices to uphold a startup's sense of security. Similarly, CivTech Scotland's robust standards for maintaining security and transparency have been critical in establishing a trusted environment. SiR Amsterdam and SiR Intergov uses the tendering process to formalize the collaboration between supply and demand, as well as utilizing a letter of intent to provide the supplier with a sense of security when it comes to the subsequent procurement phase, and the demand sides' commitment to the overall process.

Another commonality across the cases is the active role of these intermediaries in transferring innovation from startups to public actors. All cases perform as effective gatekeepers, assessing the potential of startups' innovations and aligning them with the public sector needs.

An evident difference, however, emerges in the extent of support and guidance provided to startups. CivTech Scotland and SiR Amsterdam offer a more comprehensive approach, guiding and mentoring the startups through the innovation process, while also providing entrepreneurial growth opportunities, and learning. Both CivTech Scotland and SiR Amsterdam adopt a full accelerator program, and SiR Intergov offers workshops for the winning startups. This integration of an accelerator element extends their role beyond facilitating PCP to nurturing the overall growth of the startups. SiR Intergov also has a unique emphasis on co-creation, fostering a rich environment for exchange and refinement of ideas.

Network creation is undoubtedly an essential aspect of being a PII. However, the nature and extent of its implementation vary across the cases, revealing interesting insights about the intricacies of network creation in this space.

StartOff, for instance, has been proactively engaging in activities aimed at expanding their networks. Their participation in startup events, such as 'Startup Extreme', illustrates their initiative to extend their reach and gain wider recognition. However, their experience reveals a crucial gap in the network creation process – the inadequate engagement of public sector actors. This indicates a potential flaw in the structure of the networks, emphasizing the need for a balanced and holistic network that incorporates all vital stakeholders.

In contrast, CivTech Scotland's approach to network creation appears more consolidated and established. As a late-stage II, they've built a strong professional network, and their active social media engagement underscores their dedication to maintaining robust connections with the community. They provide a plethora of tools to facilitate communication and interactions between various stakeholders, showcasing their commitment to fostering collaborative networks.

Meanwhile, SiR Amsterdam and SiR Intergov show a distinct focus on local and national ecosystems, respectively. Their approach reveals the challenges associated with network creation at different scales and the necessity to adapt strategies accordingly.

Overall, while each of the cases has its distinct approach, they all manifest a shared commitment to providing a secure environment for startups and facilitating effective transfer of innovation, reinforcing their roles as pivotal PIIs.

5.2.3 - Operational Differences

In the previous chapters, we compared our research cases by applying a theoretical lens. During the course of our research, we discovered some operational differences between the way our PIIs operationalize their programs and PCP-competitions that are not discussed in the existing academic literature. We will now discuss and compare these.

5.2.3.1 - Local, Regional and National Organizational Level

Comparing and contrasting PIIIs such as CivTech Scotland, StartOff, Startup in Residence Amsterdam, and Startup in Residence Intergov, reveals that they each have distinct structures based on the clients that initiate their innovation projects. The varied organizational levels - local, regional, and national - impact how their challenges are organized and, consequently, their overall outcomes.

1. **Local level - Startup in Residence Amsterdam:** Projects at this level are initiated by the local government in Amsterdam and public organizations in the Amsterdam Metropolitan Area. Operating at a local level often provides a concentrated and in-depth understanding of the challenges specific to that region. The problems are likely to be more niche, with solutions directly impacting the local community. The close proximity of stakeholders can also facilitate more efficient communication and quicker iterations in project development.
2. **Regional/Hybrid level - Startup in Residence Intergov:** Projects are initiated by various ministries, the Province of South Holland, and the Municipality of The Hague. Operating at a regional level provides a broader perspective than the local level. It can cater to challenges that transcend municipal boundaries, requiring more diverse and comprehensive solutions. This may lead to more complexity in coordinating different stakeholders and aligning regional policies. However, it also presents an opportunity for more extensive collaboration and resource pooling.
3. **National Level - StartOff (Norway) and CivTech Scotland:** Here, projects can be initiated by any public sector organizations within their respective countries. A national level approach is able to address broader, country-wide issues, creating solutions that can have a significant impact across a wider demographic. The diversity of challenges can be considerable, and the solutions may require substantial resources and extensive collaboration. This approach can often lead to substantial scalability of solutions, but may also involve navigating more complex regulatory and bureaucratic structures.

The chosen organizational level can influence the scale, scope, complexity, and impact of the innovation projects. Local-level projects may be more agile, closely connected to their community, and able to quickly implement and test solutions. Regional and national-level

projects, on the other hand, might offer broader impacts and the ability to leverage larger networks and resources, but they may also face more complex coordination and alignment efforts. Ultimately, the results will depend on each program's ability to effectively manage their specific challenges and effectively leverage their unique advantages.

5.2.3.2 - Accelerator Programme

An interesting aspect of PIIs that became apparent in our research is the emphasis on auxiliary acceleration programs, which run alongside the joint product development processes between the supplier and the procuring entity. These intensive educational initiatives offer additional support and mentorship to the participating startups, acting as a catalyst to their innovative capabilities.

StartOff, in our study, surfaced as an exception in this regard, with no explicit accelerator program in place. This absence, however, could be tied to the organization's current priorities. Given that their most pressing challenge lies in attracting more challenge sponsors from the public sector, StartOff might have diverted their focus and resources towards addressing this issue.

Moreover, the geographical and demographic context of StartOff may also influence this decision. Operating in Norway, a nation characterized by a broad geographical spread and a relatively small population, could potentially pose logistical hurdles. A substantial number of tech startups in Norway emerge from the Norwegian University of Science and Technology in Trondheim, a city situated some distance from Oslo, where StartOff is based. The practicalities of facilitating in-person workshops across this distance could be challenging.

However, considering the potential benefits of accelerator programs, StartOff may wish to reconsider their current approach. One potential avenue for future development could be to leverage the resources available closer to home. For instance, StartOff shares its premises in Oslo with StartupLab, a thriving startup incubator. This proximity provides a unique opportunity for collaboration, whereby StartOff could draw on the expertise and resources of StartupLab to design and implement an effective accelerator program.

In summary, while accelerator programs are common features within the PII landscape, their adoption is not universal. Factors such as organizational priorities and logistical

considerations can influence their implementation. As the landscape evolves, we anticipate further exploration of the role and impact of accelerator programs within the PII ecosystem.

5.2.3.3 - Financial Incentives for Startups

In order to encourage startups and SMEs to participate in their challenges, many PIIs provide financial incentives. StartOff, for instance, rewards the initial three potential suppliers with €5,000 each and the final winner with €45,000. However, it offers no guarantee that the challenge sponsor will procure the final solution, a maneuver that helps them navigate legal tender matters. The money either comes from the challenge sponsor or from StartOff through a grant they received from the Ministry of Climate and Environment earmarked challenges concerning the circular economy (this is discussed further in chapter 5.3.3).

In contrast, Startup in Residence (SiR) Amsterdam does not offer monetary rewards for the development of the MVP. Instead, its financial incentive is embodied in a Letter of Intent, signed between the selected startup and the municipality at the outset of the accelerator program. Should the startup meet the agreed-upon specifications during the course of the accelerator, the City of Amsterdam commits to purchasing the solution.

Moreover, SiR Amsterdam facilitates weekly physical meetings with the participating startups during the accelerator programme, providing them with a workspace. While there is no requirement for the startup to be registered in Amsterdam to apply for the programme, any procurement at the end of the programme necessitates that the company, or a subsidiary thereof, is registered in Amsterdam.

Who pays for the development of a prototype?

When it comes to financial incentives for the public sector, it could be argued that having no participation costs would make it easier to source challenge sponsors. On the other hand, a willingness to accept participation costs could be seen as a sign of real demand for innovative solutions and might make the challenge sponsor more committed to the PCP-process. For PIIs operating with financial incentives to the participating startups, it might seem the participation costs should be low as to include a bigger pool of potential challenge sponsors

5.2.4 - Comparative Overview of Public Innovation Intermediaries:

The following table (04) provides a comparative snapshot of four public innovation intermediaries (PIIs) - StartOff, CivTech Scotland, Startup in Residence Amsterdam, and Startup in Residence Intergov. The structure is developed by Alexander Holt and the CivTech Alliance, and has been supplemented with the details we've learned by researching and interviewing the PIIs.

Each row within the table presents a distinct aspect of PII operations, offering insight into their unique characteristics and practices. This comparative overview serves as a critical resource in understanding the heterogeneous nature of PIIs, highlighting the variances that exist not only in their structural characteristics but also their operational practices. By comparing these features, we can gain deeper insight into the diversity of approaches within the public sector innovation landscape and the unique challenges and successes of each PII. This table could be enriched by incorporating more PIIs and their contact information, thereby facilitating mutual learning and collaboration.

Table 03: Comparison of StartOff, CivTech, SiR Amsterdam, & SiR InterGov

Programme / Country	Who initiates each project?	How do you select the solution providers?	What is the length of the project cycle?	What is the cohort size?	How many suppliers participate at each phase of the project ?	What are the contract values for each phase of the project?	What is the legal basis of the procurement?	What is the end product?	What are the programme responsibilities?	What is the IPR position?	Who is responsible for the Project management?	What are the key programme roles?	Other comments
StartOFF / Norway	Public client (StartOff market activities to recruit new projects and their needs)	Tender - Open competition / procurement	6 months	5	Open competition 3x phase 1 (exploration phase) 1x phase 2 (dev.phase - MVP)	€ 5000 3x suppliers exploration phase (3 weeks) € 45,000 1x supplier development phase (MVP)	Article 14 EU Directive 2014/24	MVP (final solution needs to be a separate tender)	<ul style="list-style-type: none"> Project recruitment Contract and tender documents (but signed by client) Publishing the tender Project management Demo-Day Help out commercialisation 	Supplier retains all IPR-right (including source code in IT projects), Client gets extended user rights / non-time limited free to use license	StartOff project managers (not client led)	<ul style="list-style-type: none"> Project manager Co-pilot Needs assessment officer Startup / market coordinator 	
CivTech Scotland / United Kingdom	Open call for challenges – public sector organization	Open call for applications from any company that can solve the challenge	6 months total	8-13	<ul style="list-style-type: none"> Open competition 6 per challenge invited to interview 3 take part in paid exploration stage 1 per challenge to accelerator 	Exploration - £5k plus VAT Accelerator - £30k plus VAT Pre-commercial - up to £210k or £610k	Pre Commercial Procurement advertise through Public Contracts Scotland	MVP	<ul style="list-style-type: none"> Challenge and challenge sponsor recruitment Contract and tender documents Publishing the tender Project management Accelerator programme with Workshops, mentoring, support Demo-Days Pre-commercial negotiations 	Supplier retains IP Public service challenge holder receives license in perpetuity	CivTech Challenge Manager	<ul style="list-style-type: none"> Programme Director Programme Manager Head of Product and Accelerator Senior Challenge Manager Challenge Managers Comms and Events Support Studio Manager 	Part of the Scottish Government's Digital Directorate
Startup in Residence Amsterdam / Netherlands	Local government and public organizations in the Amsterdam Metropolitan Area	Tender - Open competition / procurement	6 months	10-15	Open competition 3 per challenge invited to interview 1 per challenge to accelerator	N/A	EU tender legal requirements	Tender with the City of Amsterdam	<ul style="list-style-type: none"> Challenge and challenge sponsor recruitment Contract and tender documents Publishing the tender Project management Weekly training Demo Day 	The startup remains full ownership of the product/service.	Leadmentors measure progress weekly and help startups when needed.	Programme coordinator Lead mentors Startup mentor Communications specialist	Physical presence in the City of Amsterdam
Startup in Residence Intergov / Netherlands	Various ministries, the Province of South Holland and the Municipality of The Hague	Tender - Open competition / procurement	5/6 months	11	<ul style="list-style-type: none"> Open competition 3 per challenge invited to interview 1 per challenge to accelerator 	€25,000	EU tender legal requirements	Working prototype	<ul style="list-style-type: none"> Challenge and challenge sponsor recruitment Contract and tender documents Publishing the tender Project management Bi-Weekly joint progress sessions Demo Day Scaling the solution 	The startup remains full ownership of the product/service	Program coordinator Challenge coordinator from the different government organizers	<ul style="list-style-type: none"> Program manager Program coordinator Advisor Communication & PR Challenge coordinator 	

5.3 - Challenges for PIIs

Transitioning from our exploration of characteristics, we now venture into the crux of our second research question:

What are the challenges public innovation intermediaries that work with pre-commercial procurement processes are facing?

In the forthcoming section, our cross-case analysis and discussion will be instrumental in unveiling the unique challenges that these intermediaries grapple with in their operational context.

The nature of PCP processes implies that PIIs are navigating a complex, evolving landscape with inherent difficulties. By employing a cross-case analysis, we will map out these challenges, shedding light on the obstacles PIIs encounter in stimulating and facilitating innovation within the public sector. This approach enables us to compare and contrast experiences across different cases, allowing us to identify patterns and themes that might otherwise remain obscured.

Our analysis strives to understand these challenges in their totality - not just as hurdles, but also as opportunities for growth and learning. We aspire to offer insights that could stimulate the development of effective coping strategies and, possibly, solution-oriented approaches. This exploration into the challenges faced by PIIs in PCP processes is not only crucial in providing a realistic understanding of the current landscape but also invaluable in offering pointers for policy interventions, organizational practices, and future research directions.

PIIs face numerous challenges when engaging with public actors, particularly with respect to public procurement. Based on our research, one of the most recurrent and significant challenges is the process of preparing public institutions for PCP.

Traditionally, public bodies have engaged in procurement practices with private suppliers, with the bulk of public procurement funding being directed towards established, larger corporations. This trend is mainly attributed to an ingrained risk aversion within public bodies, which typically favors larger, more established companies that are seen as less risky

than smaller startups. Consequently, many startups find themselves excluded at the initial stages of the tendering process.

Furthermore, public organizations frequently approach procurement with a preconceived notion of their needs, often rooted in their past experiences and existing 'comforts'. This bias towards familiarity over novelty typically leads to the perpetuation of existing solutions, stymieing the potential for innovative breakthroughs. Procurement competitions generally end up favoring the supplier who can offer the lowest price, which is often an outcome of economies of scale.

PIIs, therefore, aim to change this mindset among public procurers. The goal is to shift the focus towards identifying and defining the problems that need solving, while allowing the open market to devise the most effective and innovative solutions. This approach can help foster a more competitive environment that encourages creativity and innovation, rather than simply relying on familiar, pre-existing solutions.

5.3.1 - Iterating on the PCP-processes

Before launching their initiative, StartOff did a lot of initial research into existing PII-programmes. Building on the experience of CivTech Scotland and existing organizations in Norway such as LUP and DFØ. They then spent time developing their product (the PCP-competitions), adapting EU Procurement regulations to a Norwegian framework, before testing this with the first customers, ie. the public procurers and the startups and SMEs. There are several ways an PII can validate their product, one being running a competition through the different stages and making sure that both parties are satisfied with the result. This could be measured by the amount of completed competitions, and looking at how many of them go further to procurement. Another way could be recognition from international colleagues, like when StartOff was rewarded with the Innovation Leadership-award. External recognition such as this could boost the reputation of their competitions, leading them to attract more leads from public procurers and increase political support from policy- and decision makers.

5.3.1.1 - Involving the End User

It becomes very clear that the role of the PIIs is to successfully work as a matchmaker between public demand and supply side perspectives in the creation of innovation. However,

we have identified a third stakeholder that fits into the PII systems we have looked at: The general public.

The significance of citizen participation in governmental decision-making has been discussed in several studies, and observations by organizations such as the OECD and the European Commission have revealed that most public institutions fail to meet citizens' needs when procuring new solutions (Carstensen & Bason, 2012). Implementation of the PCP approach is discussed in the literature as a potential solution to this issue, stating that PCP not only promotes the public good - but also contributes to the creation of public value (Carstensen & Bason, 2012).

We challenge this perspective. PCP - especially when monitored by an PII such as StartOff, that works with balancing needs, knowledge, and facilitating the processes - works well as a tool for public sector actors that seek to procure something that does not exist. And provided that a PCP process is successful, a public actor can proceed to the PPI stage through standard procurement. On the surface, it can seem like this helps public sector actors solve important societal problems through the procurement of innovation for innovative suppliers. Sometimes this is true.

However, such a statement automatically assumes that the *supplier* has gone through the necessary citizen involvement in their ideation process, the R&D stage, as well as the finalizations of the MVP or product. PCP processes do not automatically include broad multi-stakeholder inclusion. This is a dimension that is marginally discussed in the PCP literature. In reality, managing and balancing the need of supply and demand is a challenging task, as we can see in our interviews with StartOff, SiR Amsterdam and Intergov, and CivTech. However, including the third dimension of the general public in the procurement of innovation, PCP or post-tender process (hybrid approaches like in SiR Intergov and Amsterdam) is an entirely new challenge that must be overcome.

As identified in our empirical research, SiR Intergov, for instance, works to succeed as an efficient mediator in PPI, however, their goal is to broaden their scope and involve the end-user in their co-creational processes. Such co-creational processes will probably involve a set of new challenges such as deciding the correct target groups, handling information gathering in structural processes, workshops, and open meetings, as well as managing GDPR

and data gathered from participants in the general public. This third dimension complicates the process of innovative procurement for the PII.

In sum, PCP and innovative procurement does not automatically involve citizen involvement. Adding the dimension of general public participation in PII competitions, and demand articulation from the demand side creates a new set of challenges that should be looked at.

5.3.2 - Attracting the Public Sector (Demand Side)

As PIIs are demand-side oriented tools, the process cannot start without a government entity that's willing to be the challenge sponsor procure an innovative product. Attracting the demand side is crucial in order to succeed as a PII. Several key issues contribute to this challenge:

Identifying enough actionable problems: The initial difficulty lies in obtaining an adequate volume of procurement projects from public procurers for their competitions. The unique nature of innovation procurement, often dealing with abstract problem definitions and non-existent solutions, clashes with the conventional procurement practices and mindset in the public sector.

Risk aversion and cultural resistance: Public sector entities are often hesitant to engage in innovation procurement due to the perceived risk and unfamiliarity with this more abstract approach. This contrast is particularly evident in StartOff's experience when compared to Scotland or Netherlands, where public actors queue up to participate in similar competitions.

Lack of demand-side participation: Despite a broad societal demand for innovative solutions, there's a considerable disconnect between the rhetoric and actual involvement from the public sector. Turning these grand visions of innovation into bite-sized, manageable problems suitable for a StartOff competition is a significant hurdle.

Communication and outreach hurdles: The process of informing and enticing various public actors to participate has proven to be resource-intensive, challenging, and time-consuming, particularly given StartOff's need to use public channels of communication due to its affiliation with DFØ.

Balancing risk and commitment: While StartOff has taken steps to finance projects and reduce the risk for public actors, this approach may inadvertently lower the level of commitment from the public procurers, who have less 'skin in the game.' This decreased commitment may affect their likelihood to follow through with procurement at the end of the process.

Ensuring success and sustainability: There's a need to secure high success rates for each competition, ensuring both sides are satisfied. Even after a successful competition and Minimum Viable Product (MVP) development, transitioning from MVP to actual implementation within the public actor's operations, and scaling up for the supplier remains challenging.

Navigating the public sector dynamics: Despite being part of the public sector, StartOff faces challenges typical to a startup. They need to maintain their financial stability, secure political support, win over their 'owners' (DFØ), and effectively engage in marketing and storytelling, all while navigating the complexities of public sector norms and expectations.

Who is the Customer?

In terms of identifying the 'customer' for PIIs, the context varies significantly based on their operational model and scope. For Startup in Residence Amsterdam and Intergov, the situation is straightforward as they are directly tied to specific public sector entities in need of procurement, providing them with a predefined customer base.

In contrast, for PIIs such as StartOff and Civtech, the concept of the 'customer' is more ambiguous, primarily due to their broad mandate and national-level operations. These intermediaries engage with multiple stakeholders across various government levels, making it more complex to pinpoint a singular customer identity.

Reflecting on this scenario, it may be more appropriate to consider their customer base as multifaceted, encompassing a diverse range of public sector entities at different governmental levels. This broader perspective aligns with their mission to stimulate public sector innovation across the entire nation, rather than focusing solely on a specific entity or sector. Thus, the 'customer' for these PIIs is essentially any public sector entity open to engaging in the procurement of innovation at a national scale. In order to source recurrent challenges,

they might consider establishing partnerships with industry clusters. One example might be the Norwegian Defence Research Establishment (FFI), in constant need of procuring innovative solutions.

5.3.3 - Securing Funding and Political Support

The last, but equally significant challenge we have identified in our study pertains to the crucial aspect of securing adequate funding and obtaining the necessary political support to ensure the sustainability and effectiveness of PIIs. Given the nature of their work in bridging the gap between public procurers and innovative solutions, PIIs heavily rely on both financial and political backing. This challenge is multi-dimensional and requires examination.

From a financial standpoint, the need for adequate funding is vital to the effective functioning of PIIs. These intermediaries operate in a sphere that requires significant resources for activities such as organizing competitions, facilitating interactions between public and private sector entities, running operational activities, and more. A lack of sufficient funding can restrict their capability to function effectively and may potentially limit their impact.

On the political front, PIIs often navigate a complex landscape of policy-making, bureaucracy, and decision-making processes that require the support of political actors. Gaining political endorsement is crucial not only for securing funding but also for legitimizing their role, influencing policy changes that favor innovation procurement, and ensuring a conducive environment for their operations.

Examining the Impact of Government Funding on the StartOff Program: A Paradigm Shift

The StartOff program, initiated by the Solberg government and spearheaded by the Minister of Digitisation Nikolai Astrup, has been pivotal in enabling the public sector to effectively tap into the opportunities presented by start-ups. However, in the recent state budget for 2022, the new government coalition led by the Labour party has made substantial alterations to the financial framework of the program, raising questions about its future implications. The following discussion is based on a combination of interviews with StartOff and news articles in Anbud365.⁵

⁵ <https://www.anbud365.no/regelverk/startoff-loft-kuttet-na-er-det-opp-til-stortinget/>

After two years of operations the governing coalition of Erna Solberg had proposed an additional five million to the StartOff program in 2022, viewing it as a significant investment to fuel innovation and facilitate public procurement within newly formed, expertise-intensive companies. Citing that start-ups often face complexity in vying for public contracts, despite their ability to deliver products and services that are crucial to the public sector.

However, this additional allocation was withdrawn in the amendment proposal put forth by the Støre government. StartOffs operating budget remains nearly unchanged at approximately eight million, shared between the Directorate for Administration and Financial Management (DFØ), the Directorate for Digitization, and the National Program for Supplier Development (LUP). In an additional initiative, the Ministry of Climate and Environment (KLD) has provided StartOff grants to fund projects driving new solutions for a circular economy.

Despite these fiscal modifications, Sissel Kristin Hoel, the subject leader in StartOff, assures that the program will continue to operate as usual in the forthcoming years. A special emphasis will be placed on projects related to the circular economy.

The StartOff program, without any dedicated funding for the year, necessitated that clients finance the payment mechanisms for the suppliers involved in the process. This model will persist in the next year, except for select projects in the circular economy, which will receive support.

In alignment with the action plan for escalating climate- and environmentally friendly public procurement and green innovation, it has been suggested to broaden the mandate of the StartOff initiative. The program is set to encompass measures for promoting greater interaction between the public sector and environmental technology start-ups. This expansion is anticipated to initiate two pilots in environmental technology during the current year. On the other hand, this broadening might make it significantly harder to attract challenge sponsors looking for solutions unrelated to the circular economy. Potentially narrowing the scope and missing out on StartOff challenges in other parts of the public sector.

The StartOff program, with its distinct approach to facilitating start-up involvement in public procurement, holds significant potential to stimulate innovation within the public sector. While the revised budgetary allocations may present challenges, the program's continued operation and focus on environmental technology signify a positive direction. The impact of

these changes, however, will be evident in the performance of the StartOff program in the forthcoming years.

The Importance of Consistent Political Support

The previous example shows how PIIs can be vulnerable to political change, and how this might affect their financial and operational capabilities. This highlights the importance of building political support across the political spectrum in order to secure funding. PIIs must strive to be perceived as a useful tool for fostering innovation in the public sector. In order to do so, they will have to showcase the results of successful PCP-competitions and the satisfaction of public procurers. They might also have to identify policymakers that can be turned into potential supporters by aligning the competitions with political goals.

5.4 - Conceptual Discussion: Seeing PIIs through an Entrepreneurial Lens

We have looked at characteristics - roles and functions, and discovered similarities and differences. Additionally we have identified a set of challenges that public innovation intermediaries face. These challenges seem to apply universally to the PIIs we have researched, but some have overcome them.

The following section continues our exploratory study and offers a conceptual discussion that draws on our findings, as well as our personal experiences from working in the startup sphere. Our goal with this conceptual discussion is to launch some new perspectives that should be subject for further research.

Making the Link Between PIIs and Startups

Because PIIs represent a relatively new phenomenon within PPI, with even the most mature examples being less than 10 years old - it could be argued that starting an PII might be compared to founding a startup. This perspective is shared by Alexander from CivTech, Sissel from StartOff, and Maarten from SiR Intergov. They testify that the previous startup experience of many of their colleagues does not just provide them with a better understanding of the startup perspective, but also equips them with the skills to leverage similar strategies for the success of their respective PIIs.

Given the perceived parallels between PIIIs and startups, it could be constructive to apply the lens of entrepreneurial literature to analyze and understand the functioning of PIIIs. At first glance, the two may appear distinct – startups are usually privately owned and financed ventures, whereas PIIIs are predominantly publicly run and funded entities. However, despite these superficial differences, the underlying dynamics and operational principles between them are remarkably similar.

To elaborate, consider this parallel: In the ecosystem of a startup, there are customers, products, suppliers, and investors. Similarly, in the context of a PII, there are public sponsors (analogous to customers) that present innovation challenges, PCP-competitions (akin to the product) that address these challenges, a collaborative effort between the PII and the startups (akin to suppliers) that deliver innovative solutions, and policymakers (comparable to investors) who provide the necessary funding and regulatory support.

This comparison not only underlines the inherent similarities between PIIIs and startups but also emphasizes the entrepreneurial spirit required to successfully manage and lead an PII. It paves the way for the application of successful entrepreneurial strategies and methodologies to overcome the challenges faced by PIIIs and to optimize their contribution to fostering innovation.

5.4.1 - Leveraging Startup Strategies for Enhancing PII Efficiency

PII has an integral role in fostering innovation within public sector challenges. Yet, attracting public institutions to submit PCP challenges can be a daunting task. This chapter explores strategies PIIIs can adopt from the world of startups and business to bolster their efficacy in this regard. The startup world offers an array of strategies that PIIIs could potentially implement, from sales funnels and cold calling, to robust marketing and efficient operational strategies. Here, we outline several key areas where PIIIs can draw lessons from startups:

5.4.1.1 - Embracing a Sales Funnel Approach

Sales funnels are a core strategy used by startups to visualize and manage their customer acquisition process. A similar model could be utilized by PIIIs in attracting public institutions. For instance, the top of the funnel could represent awareness-building activities like webinars, workshops, and content marketing. The middle might involve more targeted

engagement through personalized emails, and the bottom could entail one-on-one meetings or detailed presentations. Implementing a sales funnel approach can provide a structured and systematic way for PIIs to manage their interactions with potential public institutions.

Introducing the CivTech Sales Funnel for Potential Challenge Sponsors

In the pursuit of streamlining their operations, CivTech Scotland has developed a tailored sales funnel approach to effectively interact with various stakeholders. They have developed separate funnels for potential challenge sponsors in the public sector, companies participating in the challenges, gatekeepers, media, and the general public. This systematic method efficiently transitions these diverse actors from a stage of unawareness to becoming committed co-creators within the process.

The sales funnel particularly accentuates CivTech's communication strategy aimed at attracting and converting public sector organizations into challenge sponsors. This multi-staged process, comprising six distinct phases, has specific outcomes, actions, messages, and communication activities associated with each stage. It is a comprehensive approach designed not only to raise awareness but also to foster loyalty, ultimately transforming these organizations into active participants in CivTech's innovative journey.

1. Unawareness Stage:

- Outcome: Making organizations aware of CivTech Scotland.
- Online Actions: Engage via social media campaigns, especially on Twitter and LinkedIn.
- Offline Actions: Participation in industry events, forums, and digital engagements.
- Messages: Introduce the novelty and potential of CivTech, emphasizing its innovation-driving capacity in the public sector.
- Communication Activities: Regular posts on social media and blogs, press releases about CivTech news and event promotions.

2. Awareness Stage:

- Outcome: Encouraging organizations to be receptive to the idea of working with CivTech.

- Online Actions: Register contacts as leads, invite them to hot-desking events.
- Offline Actions: Host studio visits, introduce current projects, and share program benefits.
- Messages: Highlight CivTech as an affordable and successful procurement route for public services.
- Communication Activities: Share case studies and news through email and social media, continue promoting events.

3. Familiarity Stage:

- Outcome: Ensuring that organizations understand CivTech's process.
- Online Actions: Register contacts as interested.
- Offline Actions: Clarify money and staff commitments, notify internal procurement, identify challenge areas, engage stakeholders, and align the programme.
- Messages: Offer detailed explanations about CivTech's innovation flow and invite potential sponsors to submit their challenges.
- Communication Activities: Regular engagement through emails, social media, and events.

4. Consideration Stage:

- Outcome: Guiding organizations to scope their challenge.
- Online Actions: Register contacts as having their challenge scoped.
- Offline Actions: Agree on the challenge area, engage stakeholders, conduct a Challenge Discovery Workshop, and prepare necessary collateral.
- Messages: Help organizations define their challenge and guide them through the process.
- Communication Activities: Continue regular communication through emails, social media, and events.

5. Purchase Stage:

- Outcome: Signing a Memorandum of Understanding (MoU).
- Online Actions: Finalize challenge wording, agree on dates and transfer funds.
- Offline Actions: Agree on the business purposes of the license.

- Messages: No specific messages in this stage.
- Communication Activities: Send follow-up emails after signing the MoU and continue event promotions.

6. Loyalty Stage:

- Outcome: Ensuring that the organization is engaged and committed to CivTech.
- Online Actions: Encourage the organization to sign up for CivTech events, intrapreneurship programs, referral programs, and speaking invitations.
- Offline Actions: No specific actions in this stage.
- Messages: Extend a warm welcome to the 'CivTech Family'.
- Communication Activities: Continue event promotions and encourage ongoing engagement.

In summary, the sales funnel relies on a multi-channel approach, utilizing social media, email communications, event participation, and personalized interactions to engage and convert potential challenge sponsors. The focus is on educating public sector organizations about CivTech's innovative potential, demonstrating its value, and facilitating their journey from awareness to loyalty.

5.4.1.2 - Leveraging Cold Calling and Outreach Strategies

A central point in sales is that some potential customers fall off along the way, and in order to increase the amount of successful sales one should both increase the conversion rate of the sales funnel and introduce more potential customers to it. Cold calling, traditionally a business strategy, involves contacting potential clients who have not previously expressed an interest in the products or services being offered. In the context of PII, this could mean directly contacting public institutions that might benefit from submitting PCP challenges but haven't yet engaged with the PII. This proactive outreach could help spark interest and generate potential leads.

After our second interview with StartOff, we spoke to Sissel Hoel about the challenge she mentioned in our first interview: attracting public organizations and having them submit their innovation challenges. She told us that they had borrowed a trick from the telemarketing

playbook, in order to increase the amount of competitions. They committed their team to a week of cold-calling potential procurers of innovation, in order to inform them about StartOff and walk them down the line of purchase. This outreach has successfully made more public procurers aware of StartOff and made them consider sponsoring a challenge.

5.4.1.3 - Adopting Agile Operational Strategies

Agility – the ability to adapt and respond quickly to changes – is a cornerstone of startup culture. PIIIs can learn from this approach by becoming more flexible and responsive to the needs and feedback of public institutions and startups. This might involve regularly reviewing and refining their strategies and offerings based on feedback and changing market conditions.

One example of how the PIIIs can show flexibility, came from Leasi - a startup company that builds an order management software for machine rentals in the construction industry. They applied to a PCP-competition published by StartOff in the fall of 2022, wherein the municipality of Oslo was looking to buy a sharing platform for machines and equipment across the 200 public schools in the municipality. After submitting their idea drafts and outcompeting the other contestants, they were selected to develop an MVP.

Leasi highlighted one aspect about the PCP-competition that they were particularly fond of. StartOffs ability to be flexible, and adapt to their needs when it comes to safeguarding the IP of their solution.

5.4.1.4 - Developing Strong Networks and Partnerships

Startups often rely on strong networks and partnerships to succeed. PIIIs could also leverage this strategy, building alliances and collaborations with other innovation agencies, academic institutions, and industry bodies. This could enhance their credibility and reach, and lead to more recurring challenge sponsors. This strategy might prove to be particularly relevant for PIIIs operating on a national level, where their clients are not as clearly defined.

5.4.1.5 - Political Support / “Investor Relations”

As political tools, PIIIs play a pivotal role in facilitating innovative procurement and fostering public-private collaboration. Their effectiveness and worth are often measured against these

expectations, and their future funding is likely to hinge on how political leadership perceives their success. Therefore, it's imperative for PIIs to continually demonstrate their value to secure ongoing support.

PIIs operating at a national level often rely on the support of governmental agencies. The extent of this support and consequently the level of funding allocated to the PII can be influenced by changes in political leadership. A PII might be associated with a particular political party, and therefore, its level of political support could be affected when that party eventually leaves office. However, if a PII successfully navigates through several political changes and maintains its position as an effective tool for public procurement of innovation, it might be seen as politically neutral and enjoy continued support.

This transitional phase can be likened to the "Valley of Death" phase in entrepreneurship—the critical stage where a startup transitions from having a Minimum Viable Product (MVP) to achieving successful market penetration and sales. This phase is widely considered the most crucial in a startup's life-cycle, and is where most of them fail (Osawa, Miyazaki, 2006).

If we apply this analogy to StartOff, we can say their PCP competitions are their MVP, for which they've received the Innovation Leadership Award from the European Innovation Council (EIC). While they've completed a considerable number of competitions (17, possibly), their primary focus is engaging the demand side and committing them to a competition. They acknowledge this as their most significant challenge, requiring a lot of work still.

So, how might a PII like StartOff cross this metaphorical "Valley of Death"? Continuing to deliver high-quality, effective innovation procurement services is crucial. They can aim to demonstrate their value and utility irrespective of changes in political leadership and hope for sustained or even increased funding and political support based on their results and contributions to innovation in the public sector.

Alexander Holt suggests that one strategic approach is to align the work of PIIs with the goals of political leadership proactively. A noteworthy example of this approach is the DemoDay organized by StartOff on June 1, 2023, themed around 'New Solutions for Green Mobility'. This event showcased the outcomes of two competitions that responded to the needs of Bane Nor, a public company responsible for Norway's railway infrastructure.

Bane Nor aimed to make traveling to train stations safer and more convenient for cyclists. Two selected companies offered innovative solutions to this challenge. These solutions were presented at the event, followed by a panel discussion featuring the competitors and Eivind Trædal, a political representative from the Green Party. Being an enthusiastic cyclist himself, Trædal seemed impressed with the competition's results. This engagement likely enhanced StartOff's political legitimacy in Trædal's view and among his constituents.

However, while the involvement of political figures can lend credibility, it's a delicate balance. To maintain and strengthen political support, it's essential for initiatives like StartOff to avoid aligning too closely with any single political group. Achieving bipartisan support across the political spectrum ensures that the PII isn't perceived as favoring a particular political ideology, thereby broadening its appeal and legitimacy.

By adopting strategies from the world of startups and business, PIIs can potentially enhance their efficacy in attracting public institutions to submit PCP challenges. This can involve implementing a sales funnel approach, leveraging cold calling, enhancing marketing and branding, adopting agile operational strategies, developing strong networks, and fostering a customer-centric approach. While the contexts of PIIs and startups differ, there is significant scope for cross-pollination of strategies and approaches. Future research could delve deeper into how these strategies can be adapted and implemented within the specific context of PIIs, contributing to an expanding discourse on enhancing the efficacy of PIIs.

5.4.2 - Lifecycle Comparison of PIIs and Startups: A Comparative Analysis

As innovation continues to shape socio-economic landscapes, the contrast and comparison between private startups and public innovation intermediaries becomes more interesting. By examining their life cycles – a common way to understand the growth, maturation, and potential decline of organizations – this chapter aims to shed light on their similarities, differences, and potential intersections.

5.4.2.1 - Life Cycle of a Private Startup

The lifecycle of a private startup typically unfolds through a series of stages: idea conception, startup formation, growth and establishment, expansion, and maturity or exit.

1. **Idea Conception:** It begins with the identification of a market gap or a novel idea that has the potential to fill that gap. This idea must represent an innovative solution that provides a unique value proposition.
2. **Startup Formation:** This involves the development of a business plan, acquisition of initial funding (often from angel investors or venture capitalists), and the assembling of a founding team.
3. **Growth and Establishment:** In this stage, the startup executes its business plan, refines its products or services, and begins to generate revenue. This often involves securing additional rounds of funding.
4. **Expansion:** Once a sustainable business model is established, the startup can scale its operations, often branching into new markets or offering new products/services.
5. **Maturity or Exit:** Eventually, a startup either becomes a stable, mature company or undergoes an exit (either through an acquisition, merger, or initial public offering).

5.4.2.1.1 - The Valley of Death

The "Valley of Death" is a term often used in the context of startups and early-stage companies, referring to the gap between when a startup begins operations, incurs initial costs, and when it starts generating revenues. The term has its origins in the concept of the "Technology Readiness Level," which measures the maturity level of particular technologies.

In the paper by Osawa and Miyazaki (2006), the "Valley of Death" refers to the period during which startups face the highest risks and difficulties due to a lack of financial resources. This typically occurs between the development of a prototype (or proof-of-concept) and the commercial production and sales of the product. During this phase, startups may find it challenging to secure further investments because the product or technology is often unproven in the market, making it a risky investment.

In other words, the "Valley of Death" symbolizes a challenging phase in the company's lifecycle where financial resources are quickly depleting, but the income from the product or service is not yet significant enough to cover these costs. Many startups fail to cross this valley and end up folding due to insolvency.

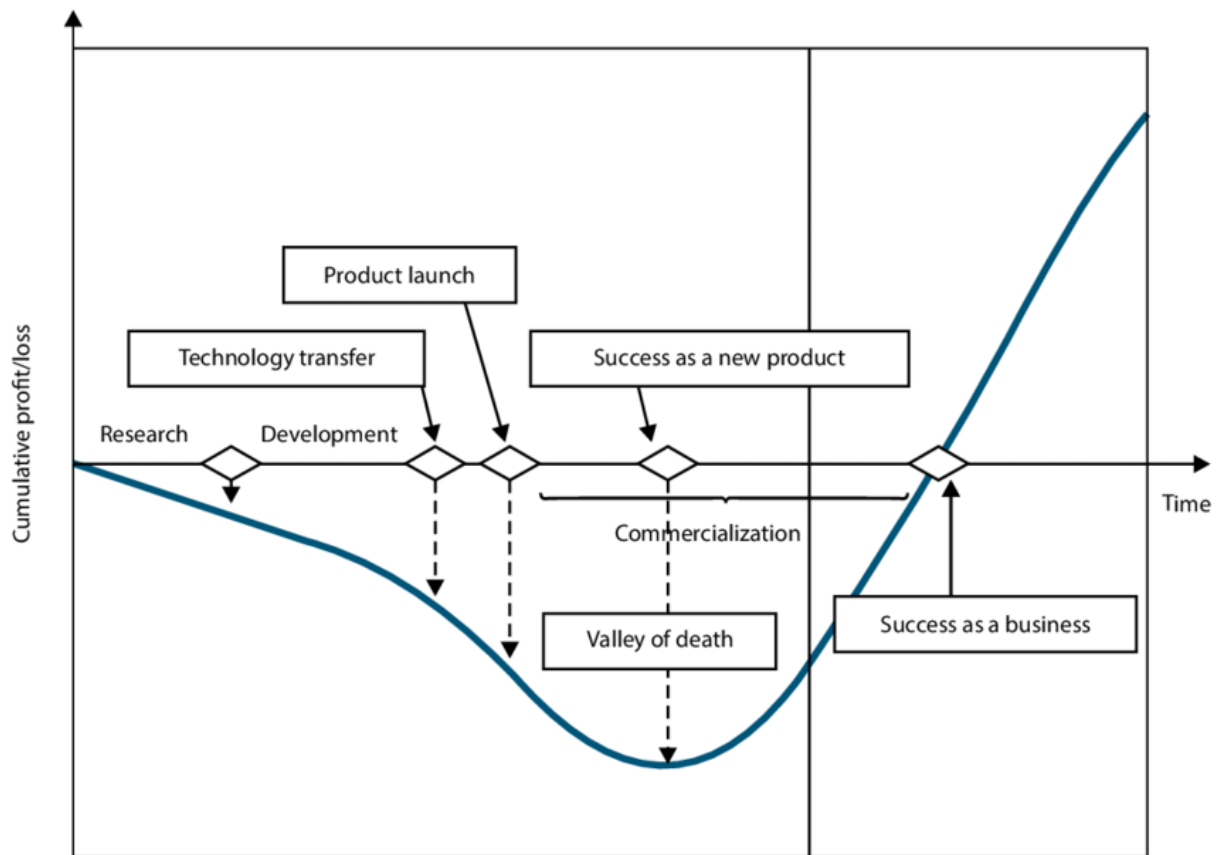


Figure 05: Valley of death (Osawa, Miyazaki, 2006).

Reaching product-market fit as an PII

Product-market fit refers to the stage at which a startup's product satisfies strong market demand. It's a point where the product has been optimized to meet the needs of its target customer segment, resulting in high user satisfaction and strong sales growth.

In the context of a PII, if we consider their PCP-competitions as the "product", achieving a product-market fit would involve a few key steps:

Understand the Market Needs: In the context of the PII, this would involve identifying the innovation needs of public sector entities. The PII must understand what type of innovations the public sector is seeking, the types of problems they need to solve, and how a PCP competition could help address these needs.

Iterate and Refine the "Product": Based on feedback from public sector entities and the results of initial PCP competitions, the PII can refine their PCP competition model. This

could involve modifying how competitions are structured, advertised, or judged to better meet the needs of public sector entities and attract more innovative solutions.

Validate the Product: This is where the PII proves that their PCP competition model can consistently deliver innovative solutions that meet public sector needs. They could showcase successful case studies, obtain testimonials from public sector entities, and demonstrate the impact of the solutions generated through their competitions.

Scale the Product: Once the PCP competition model has been validated and refined, the II can then work to scale it, reaching out to more public sector entities and hosting more competitions. At this stage, the II can focus on operational efficiency and broadening their impact.

Monitor and Adjust: Even after achieving product-market fit, it's important to continuously monitor market needs and adjust the PCP competition model as necessary. Markets and needs evolve, so staying flexible and adaptive is key for sustained success.

By following these steps, a PII could potentially reach a product-market fit with their PCP competitions, ensuring they deliver high-value innovative solutions that meet the evolving needs of the public sector.

5.4.2.2 - Proposed Lifecycle of a PII

PIIs also undergo distinct stages of development, although their lifecycle diverges somewhat from that of private startups due to their public orientation and broader mission. Here is a proposed lifecycle for PIIs:

1. **Problem Identification:** Similar to the idea conception phase in startups, PIIs begin with identifying societal or market problems that could benefit from innovative solutions. However, PIIs are often more focused on broader societal challenges rather than solely market gaps.
2. **Formulation and Fund Acquisition:** In this stage, PIIs outline their strategies for addressing the identified problems, and seek funding from various government entities. The creation of a core team of experts with diverse skill sets is also a crucial aspect of this stage.

3. Collaboration and Solution Development: PIIIs then enter a phase of collaboration, often partnering with multiple stakeholders, including public bodies, private organizations, NGOs, and the public. This stage is marked by a process of co-creation and iterative solution development.
4. Implementation and Impact Generation: Once a solution has been developed and refined, PIIIs work towards its implementation. This phase is also characterized by the measurement and communication of the impact created by the solution.
5. Expansion and Evolution: PIIIs seek to scale their impact by broadening their reach, replicating successful solutions in different contexts, or addressing new problems. Additionally, PIIIs might evolve their strategies and methodologies based on the lessons learned and the changing societal landscape.
6. Maturity and Institutionalization: In the final stage, PIIIs may become well-established institutions, continuously driving innovation for public benefit. Some may also transform into different entities, or merge with larger public or private organizations to ensure the sustainability of their mission.

While both private startups and PIIIs traverse distinctive lifecycles, they share fundamental underpinnings of identifying problems, formulating strategies, executing plans, and expanding their impact. The primary distinction lies in their core mission: while private startups primarily aim to fill a market gap and generate profit, PIIIs are funded by public entities driven by the need to address societal challenges through innovation.

Understanding the unique life cycles of PIIIs alongside those of private startups can provide valuable insights into how these different entities operate, interact, and potentially collaborate. As innovation continues to shape our society, recognizing and leveraging the strengths of both private startups and PIIIs will be integral to creating a more sustainable, inclusive, and prosperous future. Future research should further investigate the overlaps and synergies between these two lifecycles, with a view to fostering more productive public-private collaborations.

5.4.2.3 - International expansion: a logical next step for a Public Innovation Intermediary?

As time progresses and a PII adeptly navigates the formidable challenges inherent in various stages of the life cycle, it is reasonable to anticipate that numerous MVPs emerging from

PCP-competitions have successfully undergone procurement and implementation by public clients. Consequently, it may be strategically significant for the PII to contemplate facilitating the transnational diffusion of innovation, and contribute to initiatives such as the CivTech Alliance.

Yet, this venture potentially necessitates an elevated degree of political backing. Detractors may contend that the work with commercialization and broader diffusion of novel solutions should squarely rest on the shoulders of startups, claiming that it isn't the PII's role to aid in such activities. Critics could view this as the public sector displaying favoritism and unfairly assisting one private entity over others, thereby distorting market competition. Furthermore, some may argue that this function rightfully belongs to existing institutions such as Innovation Norway.

Contrarily, others may contend that active participation in an international consortium of PIIs could be highly advantageous for the nation as a whole. This could strengthen the nation's trade balance by globally promoting local innovations, while simultaneously equipping the public sector with access to a wide range of cutting-edge solutions from throughout the world.

Before eventually embarking on this course, it is crucial for the PII to gain a comprehensive understanding of its role and the relevant legal frameworks. Furthermore, the PII must delineate a clear, legally compliant scope of its capabilities, specifying what they can and cannot contribute to this endeavor. This would ensure the alignment of their actions with existing regulations and avoid potential legal pitfalls. Additional research on the CivTech Alliance and its results is required in order to counsel PIIs on this endeavor.

6.0 - Conclusions and Implications for Future Studies

This exploratory thesis of the role of public innovation intermediaries in pre-commercial procurement processes has identified common characteristics and shared challenges. The characteristics, challenges, and conceptual discussions may hopefully inspire future investigations. This chapter brings together our key findings and presents an overview of the implications for future research.

6.1 - Research Question 1:

What characterizes public innovation intermediaries that work with pre-commercial procurement processes?

The initial phase of our research focused on the intrinsic characteristics of PIIs participating in PCP processes. A comprehensive review of existing literature helped us delineate the key role of PIIs as matchmakers in innovative public procurement processes. They bridge the gap between demand and supply forces, aiding in the seamless transaction of ideas and solutions.

Our analysis further clarified the three central functions PIIs perform - demand articulation, boundary spanning, and innovation transfer and appropriation. The PII activities derived from our empirical data, gathered through interviews, translated these overarching functions into tangible actions. Based on the three functions identified through our framework, we had expected more variation between the four cases. The high degree of congruence of characteristics is in itself an interesting finding.

However, we did identify operational differences along three other conceptual dimensions; The operational level of the PIIs (local, regional, or national), the intensity and presence of their accelerator programs, and the financial incentives offered to participating startups. Incorporating these dimensions into our evaluation presented us with a more comprehensive understanding of PIIs and enabled a more nuanced comparison and contrast between the cases. The implications of this newly adopted approach extend beyond our current study, promising a robust analytical tool for future scholarly endeavors.

6.2 - Research Question 2:

What are the challenges public innovation intermediaries that work with pre-commercial procurement processes are facing?

In the subsequent phase of our investigation, we identified three primary hurdles that emerged from our analysis: Process adaptation, customer acquisition (Reaching the demand side), and political and financial support.

Customer Acquisition

The first challenge faced by PIIs is the acquisition of more challenge sponsors from the public sector. The eagerness of startups to participate contrasts with the public sector's hesitation, requiring a cultural shift toward procuring and co-creating innovative solutions. PIIs with consistent clients, such as Startup in Residence Amsterdam and Startup in Residence Intergov, found this less daunting than StartOff and CivTech Scotland, which dealt with more diverse clients. However, CivTech Scotland's success over time attests to the feasibility of overcoming this challenge even in their context. The effective sales funnel tool developed by the CivTech Scotland illustrates the potential of specific strategies to increase client engagement.

Process Adaptation

The second challenge revolves around improving and adapting the PCP processes. PIIs vary in their operational mechanisms; some use pure PCP processes (StartOff and CivTech Scotland), offering financial incentives to participating startups, whereas others, like SiR Amsterdam, and to some extent SiR Intergov, have a preceding tendering process with a letter of intent. The latter ensures that the problem is adequately addressed in a cost-effective manner before product development.

Political and Financial Support

Securing funding and political support emerged as the third significant challenge. Given PIIs' reliance on public policymakers, their financial stability can be threatened by a change in administration. The need for bipartisan support and alignment with policymakers' priorities, becomes essential to ensure continuous backing.

Interestingly, these challenges mirror those typically encountered by startups - product development, customer acquisition, and fundraising. Applying an entrepreneurial lens to address these challenges, we draw parallels between the theoretical life cycle of a startup and the development of a mature PII.

6.3 - Implications for Future Research

Our findings underscore the need for further research. Future studies could investigate these challenges across a larger set of PIIs to validate their persistence and evaluate the potential extension and refinement of our proposed strategies. This line of research will not only facilitate the growth and maturation of existing PIIs but also inform the creation of new ones. Ultimately, it could contribute to improving the quality of products and services offered by the public sector, creating greater value for the wider population.

In sum, our study underscores the complex yet crucial role of PIIs in the PCP processes. Unraveling their unique characteristics and challenges has provided us with a more nuanced understanding of these intermediaries, while also indicating several promising avenues for future research. As the public sector continues to grapple with the complexities of procuring and co-creating innovative solutions, the work of PIIs will remain an important area of academic and practical focus.

We hope that our findings and recommendations will inspire and inform further studies, ultimately contributing to the effective and efficient use of PIIs in the public sector, and their potential for delivering transformative changes through innovation.

6.3.1 - Applying an Entrepreneurial Lens

By building on the existing entrepreneurial literature, we have proposed a model of assessing the lifecycle of a public innovation intermediary by comparing these new ventures to a traditional startup. Among the key findings of this model is that the PIIs are vulnerable to changes in political leadership before they have proved their efficacy as a tool for stimulating PPI across the political spectrum. Inspired by an expression from the startup literature, this critical phase could be called the “Valley of Death”. By interviewing more mature PIIs who

have crossed this stage, we have discovered certain methods which might help a young PII mitigate some of the risks while in the Valley of Death.

- 1) Optimizing the “Product” - PCP-competitions. Trial and failure, rinse and repeat.
- 2) Gaining a product-market-fit. (attracting public procurers)
- 3) Building political support and securing consistent funding for their project.

6.3.2 - The CivTech Alliance - A Case for Further Investigation

While our study primarily focused on the individual PIIs, we encountered an intriguing entity: the CivTech Alliance. This networked institution presents a unique model that merits academic attention due to its novel approach to PCP competitions - it diffuses innovative solutions for public sector needs across borders. Even though we excluded it from our comparative analysis due to its distinct structure, its inclusion in our study reflects its potential for informing future PII practices and scholarship.

In conclusion, the CivTech Alliance represents an exciting frontier in the PII landscape. The diffusion of innovative solutions it facilitates across borders underlines the next step in PCP competitions. We anticipate that future research will delve deeper into this organization, contributing to our understanding of PIIs and the possible directions in which they can evolve.

6.4 - Concluding remarks:

The public sector could be an attractive market for innovative enterprises, but the slow and bureaucratic procurement processes can be daunting for young startups with limited resources. On the other hand, public procurers have little understanding of what is required when working with startups. Our analysis has shown that public innovation intermediaries have brought about a shift in procurement, enabling procurers to think differently, work innovatively, and collaborate on pilot projects, products, and services with small market entities. Yet, this is just the outset.

This approach to cross-sector collaboration, embodied by the work of these PIIs, is a crucial step toward redefining traditional procurement practices. The aim is to render this method of operation and procurement the “new normal,” making it more accessible for a range of

players, not just for startups but also for scale-ups, SMEs, social entrepreneurs, and other initiatives.

This statement highlights the transformative potential of PIIs in public sector innovation. Their role in catalyzing change can contribute to the public sector's ability to innovate more effectively and efficiently.

In light of our research, we suggest that public sector organizations seriously consider the value of collaborating with PIIs. Their expertise can be a catalyst for beneficial transformations, fostering faster, smarter advancements.

The prospect of an operational shift towards this new norm of procurement and work raises the potential for significant impacts on public service delivery and efficiency. The implications of these developments extend to enhancing societal value.

In addition, our study has illuminated the potential for PIIs themselves to learn from each other across borders. Such cross-learning and sharing of best practices could further enhance their efficiency and effectiveness. Moreover, it can facilitate the spread of innovative solutions across different nationalities and governments, augmenting the global capacity for public sector innovation.

As our study concludes, we underscore that the advancement of innovation in the public sector is an ongoing endeavor. The integration of PIIs can serve as a powerful impetus for this progression. Moreover, a cooperative, global network of these intermediaries could potentially be a game-changer for the public sector innovation landscape.

7.0 - References

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Appendix

Appendix 1 - Functions of Innovation Intermediaries

This table provides the work of various authors and presents the functions of innovation intermediaries as they have discovered.

Author(s)	Term used	Functions (or roles)
Shohet and Prevezer (1996)	Intermediaries	In technology transfer processes, selling and buying knowledge; providing a liaison service; and the provision of, and signposting to, complementary assets.
Howells (2006)	Intermediary	Foresight and diagnostics; scanning and information processing; knowledge processing and combination/recombination; gatekeeping and brokering; testing and validation; accreditation; validation and regulation; protecting the results; commercialization; and the evaluation of outcomes.
Klerkx and Leeuwis (2009)	Innovation brokers	Demand articulation; network composition (e.g. scanning, scoping, filtering, and matchmaking); brokerage within established networks; and enhancing the alignment of actors and mutual learning.
Albors-Garrigos et al. (2010)	Research and technology organizations	Improving R&D and technology transfer efficiency; compiling and disseminating knowledge; and addressing market failures such as appropriability barriers, a well-defined information market, innovation uncertainty, and the size of the SME population.
Intarakumnerd (2011)	Research and technology organizations	Stimulating the accumulation of technological and innovative capabilities 'within' firms and creating technological capabilities 'on behalf of firms'.
Gassmann et al. (2011)	Intermediaries	Transferring existing solutions from one industry to another through analogical thinking.
Goddard et al. (2012)	Technology and innovation centers	Exploiting new technologies through an infrastructure that bridges the spectrum of activities between research and technology commercialization.

Bakici et al. (2013)	Public open IIs	Maintaining networks with actors and communities in cities; facilitating knowledge recombination and the co-development of novel solutions; and orchestrating the collaboration of actors and communities in cities.
Intarakumnerd and Chaoroenporn (2013)	Public and private intermediaries	Consulting, brokering, mediating, and resource provision.
Kivimaa (2014)	Government-affiliated intermediary	Articulation of expectations and visions; building of social networks; knowledge gathering, processing, generation, combination, and dissemination; arbitration based on neutrality and trust; project design, management, and evaluation; policy implementation; accreditation and standard setting; and creating new jobs.
Miller (2014)	Technology and innovation center	Creating and maintaining numerous networked relationships to facilitate knowledge exchange; providing a range of services that are appropriate to maximize innovation activity and competence; and focusing on emerging technologies and retaining knowledge resources into ongoing technology-development cycles.
Edler and Yeow (2016)	Intermediaries	Performing public procurement of innovation and conducting relevant project management; linking to external market players (suppliers); public organizations; provision of specialist technology, market expertise, or specialist diagnostic expertise; supporting the definition of needs (for innovation) and procedural bottlenecks for implementation; and supporting buying organizations to acquire capabilities for future procurement processes.
Cho et al. (2016)	Pure IIs	Technology and market research; R&D product design; product testing and inspection; fusion research support; R&D consulting; material constitution inspection; R&D manpower supply and training; patent management; and technology investment and transfer.
Landoni (2017)	Knowledge intermediaries	Supporting firms to deal with technological complexity; helping firms to overcome market uncertainty; acting as a knowledge intermediary in the pursuit of innovation; and encouraging firms to cooperate and share their knowledge.

De Silva et al. (2018)	IIs	Capitalizing on existing knowledge vested in employees and collaborators; understanding and shaping the knowledge base of the innovation ecosystem; and generating internal value from their involvement in collaborative innovation.
van Welie et al. (2020)	Systemic intermediaries	Articulating options and demand; initiating and strengthening connections between the diverse parts of a certain innovation system; facilitating resource mobilization, guidance of search and legitimation; knowledge development, knowledge diffusion, and learning; and entrepreneurial activities, such as prototyping, piloting, and investment in new businesses.
Miller and Lehoux (2020)	Professional intermediaries	Seeking users to represent diverse purchasing parameters and enrolling users to represent relevant measures in the adjudication of product options.
Suominen et al. (2021)	Research and technology organizations	Serving as publicly-funded knowledge pools and technology transfer organizations; working on research or development for and with firms; and accelerating innovation and economic development.

Appendix 2 - Interview Guide

Interview Guide - Public innovation intermediaries

1. Roles:

- Can you briefly describe your role (as an innovation intermediary) in the innovation process?
- How would you define the key responsibilities associated with your role?
- In what way does your role influence the innovation outcomes?
- How do you see your role evolving in the future?

2. Functions:

- Can you elaborate on the various activities you undertake to stimulate innovation?
- How do you ensure that the innovation meets the demand and aligns with the market or public needs?
- How do you manage the interaction between different stakeholders in the innovation process?
- Could you tell me about any strategies you have in place to protect the interests of innovators?

3. Activities:

- Can you share some of the key activities you've undertaken in the recent past that have substantially impacted the innovation outcomes?
- Can you talk about a recent project you guys have worked on?
- How do these activities help in bridging the gap between the idea stage and the final product/service?
- What activities are aimed at expanding your network and why?
- How do these activities promote learning and exploring new dimensions in the innovation process?

4. Challenges:

- What are some of the main challenges you face in your role?

- How do these challenges impact the overall innovation process?
- Can you provide an example of a challenge related to policy or guidelines and how you overcame it?
- How do these challenges shape the way you operate and make decisions?

