# Business Administration Master Thesis:

*International study on the factors driving and hindering the success of Public Procurement of Innovation*

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# Acknowledgements

After completing my Master's thesis in Business Information Technology just 1.5 months ago, I am incredibly grateful that submitting this thesis marks the conclusion of my academic journey. I started my full-time job a few weeks ago and can already see the practical value of this thesis's topic. Innovation in the public sector is more important than ever, especially given the increasing labour shortages and rising costs that governments face.

I would like to sincerely thank my supervisors, Klaas Stek and Rainer Harms, for their valuable input throughout the research process. The data from the IRSPP conference used in this thesis was not the easiest to interpret, so I truly appreciate their guidance in understanding it and making the most of it.

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# Abstract

**Purpose**: This study investigates the factors that drive and hinder the success of Public Procurement of Innovation (PPI) in an international context. Given the growing importance of demand-driven innovation policies, public procurement plays a pivotal role in fostering innovation while also facing significant barriers. This research seeks to identify the key factors influencing the adoption and effectiveness of PPI across different cultural and institutional settings and providing recommendations to overcome the hindering factors.

**Design/Methodology**: A mixed-method methodology is applied, combining a Systematic Literature Review (SLR) with empirical data collection and analysis. Quantitative survey data and qualitative case presentation insights from an international procurement conference are used to evaluate the barriers and drivers of PPI. These insights are further triangulated with ten expert interviews.

**Findings**: The findings reveal that organisational, inter-organisational, intra-organisational, and external factors impact PPI implementation, also in line with the Innovation System Theory (IST). Key drivers include early engagement with suppliers, extensive collaboration and interaction, and the presence of (political) management support. Conversely, risk-averse behaviour, lack of (technical and procedural) knowledge, and too prescriptive specifications emerge as major barriers. The study highlights the role of incentive programs, pre-market consultations, training staff in overcoming these challenges.

**Conclusion**: This research provides a framework for understanding the barriers and drivers of PPI across different institutional contexts. The findings contribute to both academic discourse and practical policymaking by offering recommendations to improve the effectiveness of innovation procurement strategies.

**Keywords:** Public procurement, Innovation, Public sector

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# Acronyms

**CfT** Call for Tender *(p. 8)*

**DV** Dependent Variable *(pp. 30–32)*

**FCP** Forward Commitment Procurement *(p. 23)*

**GDP** Gross Domestic Product *(p. 1)*

**IP** Innovation Partnership *(p. 9)*
**IRSPP** International Research Study of Public Procurement *(pp. 27, 28, 30, 40, 41, 57)*
**IS** Innovation System *(p. 10)*
**IST** Innovation System Theory *(pp. ii, 10, 56)*
**IV** Independent Variable *(pp. 30, 31)*

**KMO** Kaiser-Meyer-Olkin *(p. 32)*

**NCA** Necessary Condition Analysis *(pp. 32, 35, 56)*

**OECD** Organisation for Economic Co-operation and Development *(p. 1)*

**PCA** Principal Component Analysis *(p. 32)*
**PCP** Pre-Commercial Procurement *(pp. 6–8, 23)*
**PPfI** Public Procurement for Innovation *(pp. 5, 6)*
**PPI** Public Procurement of Innovation *(pp. ii, 1, 2, 6, 7, 10, 12, 28, 30, 44, 53, 55–60)*
**PPoI** Public Procurement of Innovation *(pp. 5, 6)*
**PTP** Public Technology Procurement *(p. 5)*

**QCA** Qualitative Comparative Analysis *(p. 35)*

**SBIR** Small Business Innovation Research *(p. 8)*
**SLR** Systematic Literature Review *(pp. ii, 12, 55)*
**SME** Small Medium Enterprise *(pp. 6, 16)*

**TIS** Technological Innovation System *(p. 10)*
**TRL** Technology Readiness Level *(pp. 8, 9)*

**VIF** Variance Inflation Factor *(pp. 36, 37)*

# 1

# Introduction

Over a decade ago, Edler and Georghiou (2007) published an article advocating for a critical role of public procurement in demand-oriented innovation policy. The role of demand as an enabler of innovation has been a constant theme in innovation literature. It is often framed by the Schumpeterian dichotomy of technology-push and demand-pull (Schmookler, 1966). In this paradigm, demand triggers innovation, pulling new technologies or innovation into the market.

Around the same time as Edler and Georghiou (2007), various policy documents stressed the need to use demand-side innovation instruments (Aho et al., 2006; European Commission, 2003), signalling a growing recognition among policymakers for the potential of PPI to stimulate economic development and growth. Given that public procurement accounts for a large percentage of Gross Domestic Product (GDP) in many countries, with 14,9% in Organisation for Economic Co-operation and Development (OECD) countries (OECD, 2021, p.162), there is a clear acknowledgement of its key role in driving innovation. Moreover, countries such as Norway (15.8% to 17.1%) and the United Kingdom (13.2% to 16.2%) have substantially increased their percentage expenditure over one year. These numbers indicate the increasingly vital role governmental purchases of work, goods, and services play in stimulating and driving innovation.

Public procurement of innovation refers to either buying the process of innovation (R&D) with (partial) outcomes or buying the outcomes of innovation (European Commission, 2021, p. 5). It differs from traditional public procurement in prioritising fostering innovation and addressing specific needs or challenges rather than focussing on acquiring goods or services based on established specifications.

More recently, researchers and practitioners have seen a more significant rationale for PPI besides stimulating innovation: satisfying human needs and solving societal problems (Edquist & Zabala-Iturriagagoitia, 2012). Chicot and Matt (2018) argue that public procurement of innovation is suitable to contribute to the resolution of grand challenges.

## 1.1 Research problem

Despite PPI's tremendous potential and encouragement, public buyers and their operating environment exhibit behaviours that constrain the effectiveness and efficiency of these procedures. Public scrutiny and financial strains make public buyers risk-averse, leading them to avert PPI procedures and instead remain with traditional procurement (European Commission, 2021). While several researchers have explored the barriers and drivers related to innovation procurement, a notable shift has occurred towards identifying broader strategic factors. According to Lember et al. (2015), this shift was also much needed. In the meantime, however, the 2014/24/EU directive provided contracting authorities new opportunities to pursue innovation in the public domain, and (inter)national incentives such as Horizon2020 supported the use of innovation procurement instruments.

Moreover, a recent benchmarking study by the European Commission (2024) shows that many countries in Europe are not performing well in adopting public procurement of innovation (see Figure 1.1). While the report provides valuable recommendations, it does not offer a comprehensive review of all international barriers and drivers due to their focus on predefined indicators.

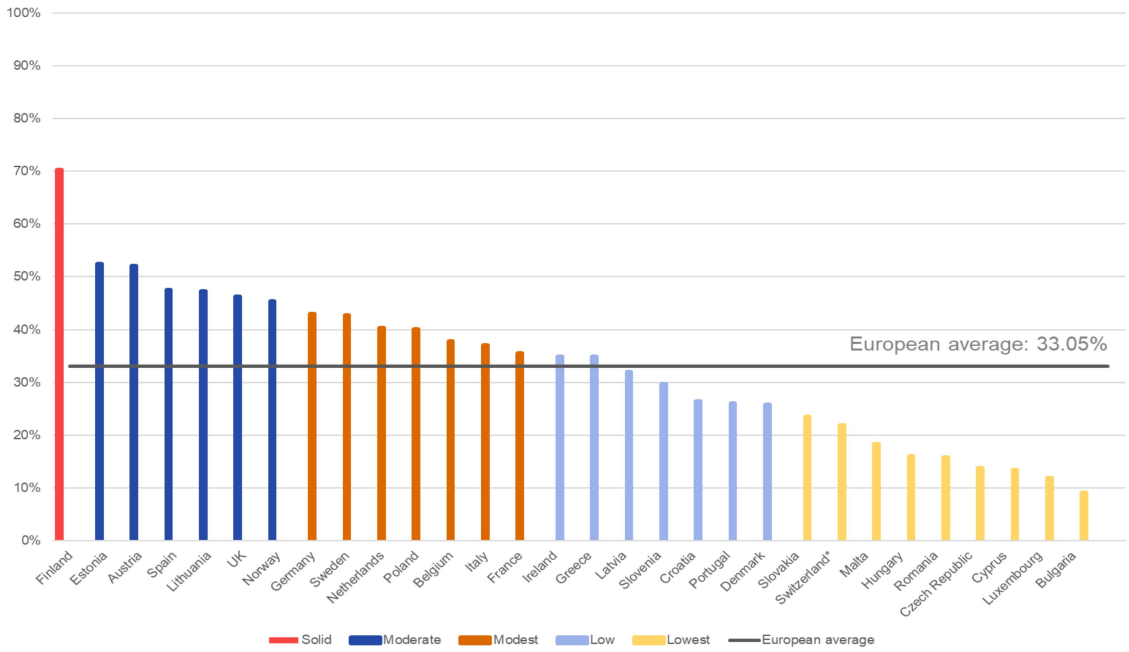


Figure 1.1: PPI Ranking EU countries (European Commission, 2024)

## 1.2 Research objective

This research aims to create a record of recommendations public organisations could use to improve the approaches of public procurement of innovation. By synthesising the literature on the topic and analysing quantitative and qualitative data of public procurement officials across countries, a concise list of barriers and drivers inherent to

public procurement of innovation approaches should become evident. The list of barriers and drivers will be further triangulated with interviews with academics and practitioners from procuring organisations across the globe.

## 1.3 Research questions

The following research question has been established based on the gap existing in the literature. The research question will be answered by identifying the barriers and drivers from literature and empirical analysis and making recommendations.

Based on the research problem, the following research question has been formulated:

> *What factors drive and hinder the adoption of public procurement of innovation, and how can these challenges be addressed?*

The aim of this research is to identify the key barriers and drivers of public procurement of innovation. After these factors are identified, recommendations will be made - based on the literature and interviews - to overcome the main barriers.

## 1.4 Research outline

The research is structured in the following way:

- Chapter 2 presents the theoretical framework of the research. It intends to delineate PPI, its scope, and its significance in the research context.
- Chapter 3 provides a more detailed understanding of the literature by conducting a literature review to identify the hindrances and drivers already found in prior research.
- Chapter 4 provides a comprehensive overview of the mixed-method research methodology. It describes the steps taken to ensure the validity and reliability of the research and the methods that will be used to analyse the data.
- Chapter 5 is dedicated to the description and analysis of the quantitative and qualitative research results. It provides a detailed account of the analysis techniques and corresponding results.
- Chapter 6 critically analyses the results from the previous chapters to interpret the findings in the context of the existing literature. It uncovers the implications, significance, and relevance of the research results.
- Chapter 7 concludes the research, describes the practical and theoretical contributions, and explains the limitations of the research.

# 2

# Theoretical Background

## 2.1 Definition and rationale for PPI

Recently, several researchers have conducted literature reviews to synthesise terminology and concepts used in public procurement and innovation literature (Kundu et al., 2020; Lenderink et al., 2022; Obwegeser & Muller, 2018). They all identified disparate literature streams and acknowledged the academic field's fragmentation.

This chapter aims to construct an understanding of the definition, rationale, and implementation of public procurement of innovation to align with the current academic research. Following a similar approach as Edler and Fagerberg (2017) in their paper on innovation policy, this thesis focusses on a definition of public procurement of innovation (what is it), the theoretical rationales (why is it needed) and how procedures are designed and implemented.

### 2.1.1 What is PPI?

The concept of public procurement of innovation remains an ambiguous term having disparate meanings with usage across contexts. To comprehend the word's connotation, the concept will be broken down into words before going into the different definitions provided by academics. This will shed a light on the intended use of each of these words.

Procurement is "the process of acquiring goods, works and services, covering both acquisition from third parties and in-house providers" (Murray, 2009, p. 199). It is closely related to purchasing, the term used in the private sector. The difference, however, is that procurement encompasses the make-or-buy decision contrary to purchasing. In this research, the concept of procurement will be used. Later, some procurement framework to evaluate the barriers and drivers will be introduced.

In the context of procurement, the term public refers to governments and state-owned enterprises as buyers. Public procurement can be defined as the purchase of goods, services, and works by governments and state-owned enterprises (OECD, 2021). Similar to this definition, both governments and state-owned enterprises are addressed in this research. Some examples of state-owned enterprises – also referred to as semi-governmental

or quasi-governmental organisations – are the Dutch Cadastre or the British Thames Water.

Baregheh et al. (2009) conducted a literature review to develop a multidisciplinary definition of innovation. They define innovation as "the multi-stage process whereby organisations transform ideas into new/improved products, services or processes, to advance, compete and differentiate themselves successfully in their marketplace" (Baregheh et al., 2009, p. 1334). Innovation differs from invention – the creative act – in that it is an organisation's first or early employment of any idea (Becker & Whisler, 1967). The focus for this thesis will be on the first employment of an idea, but it does not exclude the early adoption of new ideas either.

Several academics identified the gap in research regarding innovation and public procurement, but the academic field is fragmented regarding the definition of the term used.

Rothwell and Zegveld (1980, p. 181) were among the first academics to write about innovation within a government setting by advocating the advantages of innovation-oriented procurement for developing and early acceptance of goods based on new or emerging technologies. Edquist and Hommen (1999) coined Public Technology Procurement (PTP) to distinguish it from regular procurement. Their 'ideal' type of PTP is "when a public agency places an order for a product or system which does not exist at the time, but which could be developed within a reasonable period" (p.5). It was later re-labelled as Public Procurement for Innovation (PPfI) by Lember et al. (2011) and Edquist and Zabala-Iturriagagoitia (2012), among others. In this approach, several stages are defined (Edquist & Zabala-Iturriagagoitia, 2015, p.10):

- Identification of a public agency's mission needs or of a grand challenge
- Translation of the identified challenge into functional specifications
- Tendering process
- Assessment of tenders and awarding of contracts
- Delivery Process

However, the definition and approach do not account for innovation through recombining existing goods or services and exclude most process innovations. Rolfstam (2012, p.1) takes a wider perspective and defines Public Procurement of Innovation (PPoI) as "purchasing activities carried out by public agencies that lead to innovation". With this approach, he ensures that any Schumpeterian innovation types are considered. This definition is also used by Chicot and Matt (2018), among others. Edler and Yeow (2016, p.415) take on a different definition, defining PPoI as "the purchase of a solution that is novel to the buying organisation in order to serve an organisational need". Purchasing will either lead to triggering innovation by adopting a new solution or responding to an innovation by adopting it for the first time in the organisation. This definition is closely

related to how the European Commission defines innovation procurement. They refer to it as any procurement where an organisation either buys the process of innovation (i.e. R&D) or the outcomes of innovation. This definition in followed in this thesis.

Innovative public procurement is another research stream that could be identified (Obwegeser & Muller, 2018). Unlike PPfI and PPoI, innovative public procurement is mostly concerned with innovations in the procurement process instead of procuring innovative products or services. This research streams has been excluded as the main interest is to research the procurement of innovative products or services.

Another term often used jointly with PPI is Pre-Commercial Procurement (PCP), an approach available since 2007. The European Commission (2021, p.56) defines it as an approach to procuring R&D services "whereby the public purchaser does not reserve the R&D results exclusively for its use but shares the risks and benefits of the R&D services with the service providers". This approach is used to develop new products or services for a specific need or challenge up to commercial procurement (which is not part of PCP). Edquist and Zabala-Iturriagagoitia (2015) argue that PCP cannot be considered a demand-side policy instrument concerning innovation as commercialisation is not part of the PCP process. The process should be considered more of a technology push than a market pull instrument in relation to innovation. Whether or not PCP is labelled as a demand-side instrument does not affect the objectives of this research.

Opposed to PCP, the *innovation partnership* instrument includes the commercialisation phase. Both PCP and the innovation partnership are instruments used for radical innovation. Following the 2014/24/EU directive, innovation partnership can only be used when no solution is available in the public market.

### 2.1.2 Why to use PPI?

A variety of rationales for adopting public procurement as an innovation policy tool exist. Academics and governmental organisations acknowledge more or less comparable drivers. Rationales that are referenced to most are (1) generation and diffusion of innovation due to remedying market and system failures, (2) improving the quality and efficiency of public services, and (3) the addressing of societal or grand challenges (Kundu et al., 2020). These rationales are discussed below.

Less prevalent rationales, nevertheless legitimate, are sustaining a competitive advantage in the market or helping start-ups and innovative Small Medium Enterprises (SMEs) to launch and grow. Rolfstam (2012) argues that PPI could stimulate private sector innovation to sustain a competitive advantage in a global economy. For the European Commission (2021), on the other hand, an important rationale is to support start-ups and SMEs in launching and growing. By acting as a lead customer, governmental organisations could allow these start-ups and SMEs to test their products or services in real-life conditions. Both of these drivers are in one way or another related to the prevalent rationales:

- **Generation/Diffusion of innovation (with respect to system/market failures)**: Both Chicot and Matt (2018) and Edquist and Zabala-Iturriagagoitia (2015) reason that PPI has as its primary goal to spur innovation. For Iossa et al. (2018) and Edler and Georghiou (2007), there is an underlying reason why PPI is an especially useful procedure for boosting innovation. They discuss the role that PPI could play in overcoming market and system failures. On the one hand, suppliers often lack knowledge of customers' needs. On the contrary, buyers fail to recognise possible innovation early (i.e. market failure/asymmetric information). Besides, radical innovation usually has higher entry and switching costs, and timely and large-scale use by a public institute could lower transaction costs.

- **Quality and efficiency of public services**: As the European Commission (2021) indicates, an innovative solution is rarely procured for its innovative character alone. It would become interesting for public buyers when it enables better results at an optimised budget (European Commission, 2021, p.8). Therefore, the main justification for PPI would be to improve both the performance and delivery of public services Chicot and Matt, 2018; Edquist and Zabala-Iturriagagoitia, 2012.

- **Address societal/grand challenges**: Edler and Georghiou (2007) indicated that PPI has a strong potential for improving public infrastructure and services. There is a possibility to link the procurement of innovation to a normative policy such as sustainability or a digital transition (European Commission, 2021). Edquist and Zabala-Iturriagagoitia (2012) argue that PPI is a relevant demand-side instrument that could be exploited to mitigate grand challenges. The lack of technical characteristics in the PPI process extends the ability and creativity of potential suppliers to provide innovative solutions to the challenges.

### 2.1.3 How to use PPI?

The procedure for innovation procurement follows an approach that allows the complementary use of PCP, PPI, and the Innovation Partnership. An outline of this approach is shown in figure 2.1. With PCP, the public authority procures R&D services if no existing solutions satisfy the authority's needs. There is an unbundling of R&D and commercialisation. As shown in figure 2.1, PCP is merely involved in the R&D phases. Different from traditional R&D procurements, the benefits and rights of the R&D results are shared between the procurer and the public authority.

Another unique aspect of PCP is the involvement of multiple suppliers. The procurement process is divided into sequential phases in which suppliers get funding for each phase. At the end of each phase, the results of each supplier will be evaluated, and parties will be excluded stepwise. The start of a procedure always concerns itself with describing the challenge and needs, often called curiosity-driven research or open market consultation. This phase aims to start an open dialogue with potential suppliers and stakeholders

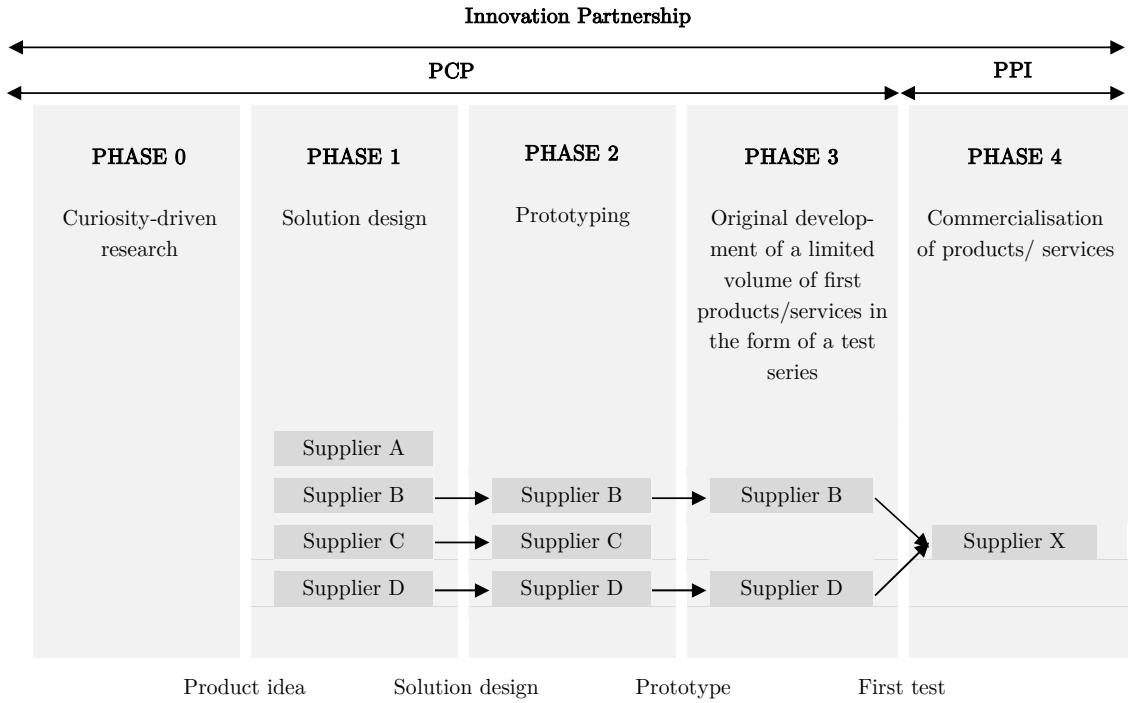


Figure 2.1: Product innovation lifecycle

to determine state-of-the-art and current developments in the market in preparation for the Call for Tender (CfT).

After a subset of suppliers have been nominated, they are granted a budget to perform a feasibility study of the proposed solutions and technologies. The expected output is often a report in which the suppliers demonstrate the commercial, financial, and technical feasibility of their proposed solutions. This stage usually lasts three to six months and has approximately € 50,000 available for each supplier.

Once the feasibility studies have been evaluated, the procuring organisation again elects a subset of suppliers to move on to the next round, the prototyping phase. In Small Business Innovation Research (SBIR) – one of the PCP procedures - this is the last phase. Regular PCP, however, prescribes a distinction between a testing and development phase.

The prototyping phase aims to take the concepts from the feasibility study and turn them into working prototypes. These prototypes are expected to have a high Technology Readiness Level (TRL), a term used within the EU to test the maturity of technologies during their acquisition. The levels are described in Table 2.1.

In the final phase of PCP – the development phase – the solutions of the selected suppliers are verified and compared to test the performance in real-life operational conditions. If a procuring organisation plans to acquire the technology or service that has been developed, the authority must do this via a regular tendering procedure.

The acquisition or commercialisation of an innovation occurs in the public procurement of innovative solutions. As we have indicated earlier, a procuring organisation can act as an early adopter and buy a product, service or process new to the market with substantially

novel characteristics (European Commission, 2021, p.6). Based on the degree of innovation, a distinction can be made between two types of PPI: adaptive and developmental (Edquist & Zabala-Iturriagagoitia, 2012).

Adaptive PPI is when the procured product, service, or process is incremental and only new to the country in which it is procured. Innovation is needed to adapt the solution to the local or national market conditions. Developmental PPI, conversely, creates a completely novel solution due to the procurement process. It requires radical innovation as opposed to incremental innovation.

In classic cases, the procuring agency acts as the end-user of the product or service. The buying organisation utilises its demand to influence or induce innovation. This type is called direct procurement (Edquist & Zabala-Iturriagagoitia, 2012). On the other hand, there are cases where an agency functions as the catalyst, coordinator, and technical resource to benefit end-users in the private sector. The procurer is not the end-user but aims to mobilise the development of innovations for broader public use. Catalytic procurements are considered competence- and resource-intensive due to the required coordination of actors who can offer the solution and who will use the solution.

Combining the R&D and the commercialisation phase is also possible as of 2014. The European Commission introduced the Innovation Partnership (IP) in Article 31 of the 2014/24/EU Directive. The so-called "valley of death" can be bridged by combining both phases. An innovation partnership usually consists of three phases: the selection phase, the R&D phase and the commercial phase. These phases correspond with what has been discussed already.

In the commercialisation phase, the parties will present the final results only if they correspond to the performance levels and maximum costs agreed (European Commission, 2021). What procedure to pick depends on the needs of the organisation and the solutions available in the market. With very new/young technologies - TRL 2 to 6 – it is unclear what minimal quality requirements it could meet or at what price the solution will be available. In this case, pre-commercial procurement seems to be the most suitable procedure.

| Level | Description |
|---|---|
| 1 | Basic principles observed |
| 2 | Technology concept formulated |
| 3 | Experimental proof of concept |
| 4 | Technology validated in lab |
| 5 | Technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies) |
| 6 | Technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies) |
| 7 | System prototype demonstration in operational environment |
| 8 | System complete and qualified |
| 9 | Actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space) |

Table 2.1: Technology Readiness Levels (European Commission, 2014b)

## 2.2 Innovation Systems

To develop a deeper understanding of PPI and identify the specific theoretical contributions of this thesis, a theoretical lens can be applied. Two theories frequently mentioned in the literature are institutional theory and IST.

Rolfstam (2012) draws on institutional theory in his research on PPI, and more recently, Perkmann and Phillips (2024) has advocated for using this theory as a framework for evaluating the influence of social context on innovation. This theory focusses on the influence that institutions have on organisations and innovation.

Another widely used theory is IST, which emphasises interactions between actors in a system, such as firms, governments, and research institutes. Popularised by Edquist (1997), this theory will serve as the primary theoretical lens for evaluating the results of this thesis. It provides a useful perspective for understanding how barriers can be mitigated by strengthening the functions of the innovation system.

### 2.2.1 Innovation System Theory

One of the earliest approaches to innovation policy was the *linear model*, which postulates that innovation begins with basic research, followed by applied research and development, and ends with production and diffusion (Godin, 2006). The model was termed *linear* due to the belief that innovation follows a sequence of well-defined, consecutive stages. This approach was largely based on the assumption that innovations are applied scientific knowledge (Borrás & Edquist, 2019, p. 6).

However, innovation processes are often not strictly linear, and the model has largely been replaced by the Innovation System (IS) approach, which emphasises that innovation depends on interactions between various actors. Over the years, a variety of IS frameworks have been developed and applied, including global (Binz & Truffer, 2017), national (Lundvall, 1988), regional (Cooke et al., 1997), sectoral (Malerba, 2002), and technological approaches (Carlsson & Stankiewicz, 1991).

Each of these approaches has its advantages and disadvantages. However, in the context of PPI, the Technological Innovation System (TIS) approach is the most suitable. Unlike global, national, and sectoral approaches, TIS is not constrained by geographical boundaries.

To understand the complex dynamics of a technological innovation system, a functional approach was developed. Instead of focusing on the structure of an innovation system, this approach highlights a set of processes that are important for the effective performance of a TIS (Wieczorek & Hekkert, 2012). Several researchers have categorised these processes into functions to better assess the performance of an innovation system (Bergek et al., 2008; Hekkert et al., 2007). Table 2.2 presents the seven functions that constitute an innovation

system, as defined by Hekkert et al. (2007). These functions will be related to the results of this thesis to place the results in a broader perspective and understand what part of the innovation system needs to be improved.

| Factor | Definition |
|---|---|
| Entrepreneurial activities | The presence of active entrepreneurs that turn new knowledge, networks, and markets into business opportunities |
| Knowledge development | Learning by searching and learning by doing through R&D projects, patents and R&D investments |
| Knowledge diffusion and networking | The exchange of information and collaboration between different actors in the system |
| Guidance of the search | The activities within the innovation systems that can positively affect the visibility and clarity of specific wants among users |
| Market formation | The creation of a protected space for new technologies |
| Resource mobilisation | The allocation of financial, human, and infrastructural resources to support innovation initiatives |
| Creation of legitimacy | Advocacy and coalition-building activities to gain societal and political support for new innovations |

Table 2.2: Functions of innovation systems (Hekkert et al., 2007)

# 3

# Literature Review

## 3.1 Literature review design

A literature review will be conducted to synthesise the corpus of literature on barriers and drivers of public procurement of innovation. The literature review will guide our conceptual framework of barriers and drivers. Preferably, a SLR is performed, which has the advantage of more data collection transparency with a higher objectivity (Tranfield et al., 2004). It would, however, take multiple researchers to ensure the validity and reliability of the performed review. Therefore, this research will conduct a general literature review, a subset of the narrative literature review. The general literature review comprises literature to review the salient and critical aspects of contemporary knowledge regarding a topic of interest (Onwuegbuzie & Frels, 2016, p.24).

By following a structured approach with a transparent narrative, bias will be reduced and internal validity will be ensured. In this research, the grounded theory approach of Wolfswinkel et al. (2013) forms the basis of the structure. In addition, the updated PRISMA flow chart adapted from Page et al. (2021) is being used to visualise the selection process of the papers, as shown in Appendix A.

To provide the reader with a stable basis and define some of the core concepts for the literature review, the relevant work in innovation procurement is discussed before outlining the hindrances and enablers of PPI.

| Number | Task |
|---|---|
| **1. DEFINE** | |
| 1.1 | Define the criteria for inclusion/exclusion |
| 1.2 | Identify the fields of research |
| 1.3 | Determine the appropriate sources |
| 1.4 | Decide on the specific search terms |
| **2. SEARCH** | |
| 2.1 | Search |
| **3. SELECT** | |
| 3.1 | Refine the sample |
| **4. ANALYZE** | |

| | |
|---|---|
| 4.1 | Open coding |
| 4.2 | Axial coding |
| 4.3 | Selective coding |
| **5. PRESENT** | |
| 5.1 | Represent and structure the content |
| 5.2 | Structure the article |

Table 3.1: Five-stage grounded-theory method (Wolfswinkel et al., 2013)

### 3.1.1 Defining the literature review

The inclusion and exclusion criteria remove redundant and unrelated articles from the search results. Peer-reviewed articles and reviews that discuss the barriers and drivers of public procurement of innovation are included in the search. An exception is made for governmental articles (i.e. grey literature) since they uniquely contribute to the research field. Moreover, the search is limited to articles written in English. Qualitative and quantitative reports will be both be included in the review to keep a wide perspective.

Due to the interdisciplinary field, with research grounded in innovation management, procurement and public administration, this literature review focuses on keywords instead of journal selections. There are no set boundaries on the publication date, but any regulation-related barriers and drivers from papers published before 2014 will be excluded due to the 2014/24/EU directive. (Inter)-organisational drivers and barriers, on the other hand, would still be relevant to consider. All the inclusion and exclusion criteria are displayed in Table 3.2.

| | **Inclusion Criteria** | **Exclusion Criteria** |
|---|---|---|
| **Topic** | Barriers and drivers concerning public procurement of innovation | Innovative procurement, private sector procurement |
| **Language** | English | |
| **Publication date** | Before September 2024 | Before 2014 |
| **Publication outlet** | Peer-reviewed articles and reviews, organisation paper | Conference papers, book chapters |

Table 3.2: Inclusion and Exclusion criteria

### 3.1.2 Sources and search terms

Several databases, such as Scopus, Web of Science, EBSCOhost, and Google Scholar, have been included to get a wide overview of the field and ensure no relevant articles are missed. Navigating through Google Scholar will help to see whether the set inclusion and exclusion criteria are correct or whether revisiting the criteria is needed.

The string shown below contains the search terms used to find all the relevant papers. All terms related to public procurement of innovation are included as the academic field uses disparate words to describe the same concept.

The search string below follows the Scopus syntax, but comparable search terms have been used for the other databases. Web browsing has been used to identify relevant governmental records. The PRISMA flow chart on the next page shows the process of selecting the relevant reports. For all studies included in the review, snowballing sampling has been used to identify additional relevant articles.

```
TITLE-ABS-KEY (
"innovation procurement" OR "procurement of innovation*" OR "procurement for innovation*"
OR "public technology procurement" OR "pre-commercial procurement" AND
"driver*" OR "incentiv*" OR "enabler*" OR "opportunit*" OR "foster*" OR  "facilitat*"
OR "barrier*" OR "obstacle*" OR "challenge*" OR "imped*" OR "hindranc*" OR "pitfall*")
AND ( LIMIT-TO ( DOCTYPE , "ar")  OR  LIMIT-TO ( DOCTYPE , "re") )  AND  ( LIMIT-TO
(LANGUAGE, "English") )
```

### 3.1.3 Coding

The reports have been coded using an open and selective coding approach. For all 35 reports, the findings and insights have been highlighted, and the excerpts have been re-read to capture the underlying categories from the set of variables (i.e., barriers and drivers). The formation of categories is an interplay between the researcher's interpretation and the use of existing categorisation schemes.

## 3.2 Literature review characteristics

Before delving into the results, this section describes the general characteristics of the identified studies. They provide an overview of the topic's relevance in the existing literature and the geographical areas where research on barriers and drivers of public procurement of innovation has been conducted.

### 3.2.1 Publication year

Figure 3.1 illustrates the distribution of studies from 2010 - 2023. Despite the topic's relevance nowadays, there is a noticeable dearth of publications addressing barriers and drivers of public procurement of innovation in recent years.

### 3.2.2 Country distribution

Approximately one-third of all reviewed articles have an international focus, representing various regions. European studies are most prominent, with six articles, and there is one study from the OECD, along with two others that involve a mix of countries. Among articles focussing on individual countries, the United Kingdom emerges as the most frequently examined, comprising 19% of studies, followed by Sweden and The Netherlands at 11%. Additionally, several other countries are featured in articles, including Finland, Denmark, Greece, Norway, Spain, and Canada.

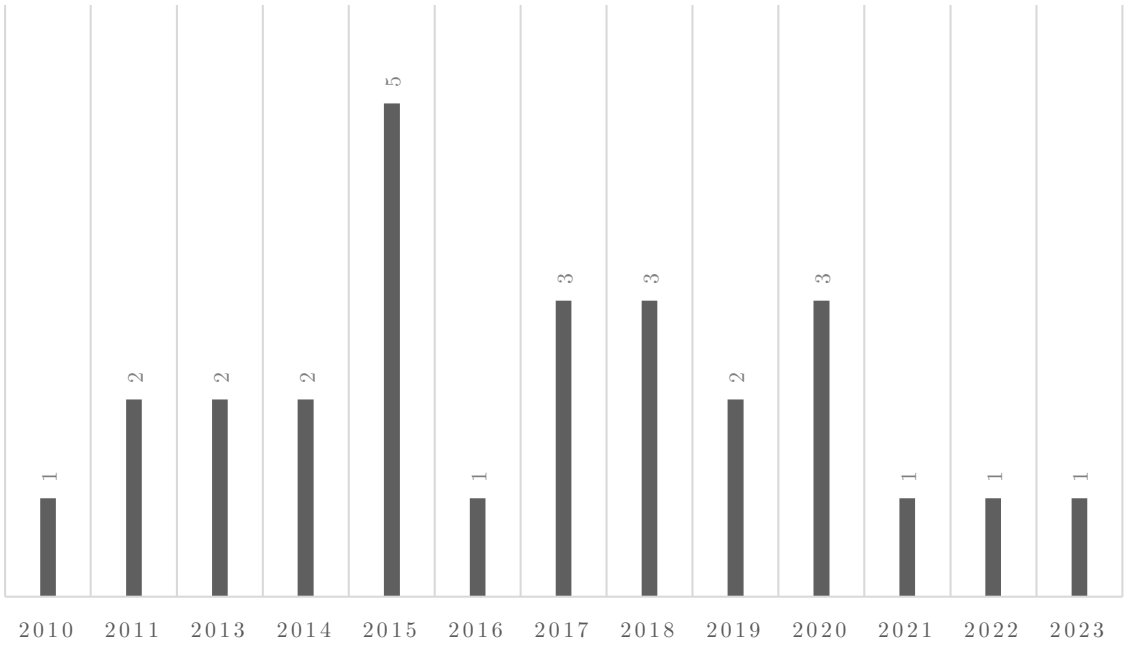


Figure 3.1: Publication years

### 3.2.3 Categorisation of the barriers and drivers

Based on the findings and insights from existing literature, the upcoming paragraphs provide a comprehensive overview of all relevant barriers and drivers of PPI. All factors have been categorised into four primary domains: (1) External and environmental, (2) Inter-organisational, (3) Organisational and cultural, and (4) Intra-organisational and resources. The substance of each category will be further elucidated in the respective paragraphs. While it would be possible to delineate the barriers and drivers into more granular subcategories, a deliberate decision has been made to maintain a broader, more abstract level of categorisation. The categorisation has been adapted from Smith et al. (2019) and includes internal and external barriers/drivers.

## 3.3 Literature review results

### 3.3.1 Inter-organisational factors

Inter-organisational factors pertain to obstacles and enablers that arise from interactions, collaborations, or relations between different organisations involved in the procurement process (i.e., procurer and supplier). Examples could be partner relations and the division of tasks (Smith et al., 2019).

The literature has identified the subsequent factors as impediments to the success of public procurement of innovation in this category. They are summarised in Table 3.3:

- **Lack of interaction between suppliers and procurers**: A key factor hindering the successful implementation of PPI is the lack of (early) interaction between public

procurers and suppliers (Sánchez-Carreira et al., 2019). In a survey of 800 suppliers in the UK public sector, 79.2% of respondents categorised lack of interaction as a key barrier (Georghiou et al., 2014; Uyarra et al., 2014). Moreover, only 33% of the respondents experienced early interaction with the procurement body frequently. Timmermans and Zabala-Iturriagagoitia (2013) referred to this hindrance as an information challenge – firms were not provided with adequate information to trade successfully with the public sector. One cause of the lack of interaction being a main barrier could be the increased technical complexity associated with PPI solutions (Caloghirou et al., 2016). In a case study by the same author, the public organisation did not seem to have adequate capacity to support and monitor the coordination of the different actors (Caloghirou et al., 2016, p.8). OECD (2017) also finds difficulties in procuring organisations in an early market consultation and dialogue with stakeholders. Another reason mentioned in the literature is the effect of regulations on the regularity of interaction. Melander and Arvidsson (2020) claim that regulations limit the interactions between procurers and suppliers.

- **Contract issues**: Another barrier in the literature concerns the length, size, and formulation of contracts. According to Caloghirou et al. (2016), most contracts are not suitable for SMEs, and they, moreover, favour well-established providers. Georghiou et al. (2014) and Uyarra et al. (2014) have the same observations and conclude that predominantly SMEs and micro firms perceive the size and length of a contract as disadvantageous. On the other hand, Georghiou et al. (2014) and Uyarra et al. (2014, p.640) also found evidence that a small contract size disincentives innovation in large and R&D-intensive organisations.

- **Lack of competition**: In the case studies of Timmermans and Zabala-Iturriagagoitia (2013) and Brogaard (2017), the procuring organisation experienced difficulties mobilising suppliers to join the bids. Less competition could lead to higher costs or a lack of realisation of intended quality improvements for the public partner (Brogaard, 2017, p.152). There are different reasons for the limited suppliers joining, but Timmermans and Zabala-Iturriagagoitia (2013) believe that providing the right incentives could help solve the problem.

| Factors | References |
|---|---|
| Contract issues | Caloghirou et al. (2016), Georghiou et al. (2014), and Uyarra et al. (2014) |
| Lack of interaction between suppliers and procurers | Caloghirou et al. (2016), Georghiou et al. (2014), Melander and Arvidsson (2020), Sánchez-Carreira et al. (2019), Timmermans and Zabala-Iturriagagoitia (2013), and Uyarra et al. (2014) |
| Lack of competition | Brogaard (2017) and Timmermans and Zabala-Iturriagagoitia (2013) |

Table 3.3: Inter-organisational barriers

The following factors were identified by literature as drivers of the success of public procurement of innovation, as also shown in Table 3.4:

- **Competition-innovation conundrum**: While a lack of competition forms a barrier to PPI success, a balance between competition and innovation seems to drive success. It is known that competitive selection of suppliers enhances the value for public sector buyers. However, it turns out that supplier firms were less motivated to innovate when they had to compete for contracts and thus had no guarantee of winning and making a return on investment (Adjei-Bamfo et al., 2023, p.398). Something similar is mentioned by the European Commission (2014a), which mentions that competitors could also form groups to deliver better results.

- **Extensive collaboration and interaction**: A critical capability for the successful realisation of PPI projects is the extensive collaboration and interaction between suppliers and procurers during all phases of the procurement process (Brogaard, 2017; Caloghirou et al., 2016; Sánchez-Carreira et al., 2019). Collaboration and interaction could help set up the right specifications, manage risks and effectively implement and complete the projects. When the project concerns a radical innovation, information exchange is even more important, as Saastamoinen et al. (2018) suggested. Adjei-Bamfo et al. (2023) also find that a close interaction and relationship among public procurement actors is vital for PPI success. Similarly, OECD (2017) stresses the importance of coordination between horizontal and vertical levels of the government.

- **Early engagement**: Close and early engagement with suppliers provides access to industry-specific knowledge that may not be readily available within the procurement unit (Zelenbabic, 2015). This knowledge can be leveraged to develop more tailored and appropriate functional specifications for the procurement process. In addition, as highlighted by the European Commission (2014a, p.26), consulting with other public organisations is a useful preparatory step before initiating a formal procurement procedure. Forward commitment procurement could provide the market with early notice of upcoming projects.

  Case research by Pelkonen and Valovirta (2015) underscored the importance of early interaction between the procurer and suppliers, especially in encouraging and enabling service innovations. Importantly, suppliers also value early engagement, with 60% believing that early interaction with the procuring organisation encourages innovation and 58% believing the same about advanced communication of future needs (Georghiou et al., 2014).

### 3.3.2 Intra-organisational and resource factors

Intra-organisational factors originate from sublevels of the organisation, such as departments, teams, projects, and individuals (Smith et al., 2019, p.120). Resources within the

| Factors | References |
|---|---|
| Early engagement | European Commission (2014a), Georghiou et al. (2014), Pelkonen and Valovirta (2015), and Zelenbabic (2015) |
| Extensive collaboration and interaction | Adjei-Bamfo et al. (2023), Brogaard (2017), Caloghirou et al. (2016), European Commission (2014a), OECD (2017), Saastamoinen et al. (2018), and Sánchez-Carreira et al. (2019) |
| Competition-innovation conundrum | Adjei-Bamfo et al. (2023) and European Commission (2014b) |

Table 3.4: Inter-organisational drivers

levels of the organisation, such as human resources, time, and technical knowledge, are indispensable for successfully implementing innovation.

For the intra-organisational domain, the following barriers are prevalent in the literature. They have also been summarised in Table 3.5:

- **Lack of knowledge about PPI and technologies**: Many studies have identified a lack of knowledge as a recurring barrier to public procurement of innovation (e.g. Sánchez-Carreira et al., 2019; Timmermans & Zabala-Iturriagagoitia, 2013). About half of the suppliers (52.4%) question the knowledgeability of public procurers about the technical aspects of their products and services (Georghiou et al., 2014; Uyarra et al., 2014). Plepys and Richter (2016) found a similar knowledge gap between public sector procurers and suppliers (in this case, providers of lighting solutions). Public procurers do not seem to be aware of the advantages and capabilities of some technologies, and this hinders innovation because a strategic approach that goes beyond decision-making based on simple criteria, such as price, is required (OECD, 2017, p.43).

  Not only does the absence of technical knowledge inhibit innovation. Insufficient institutional, organisational, financial, and legal knowledge also hinders (Caloghirou et al., 2016; Iossa et al., 2018; Werkgroep Innovatiegericht Inkopen, 2022). Soft and hard skills are needed for the best solutions to be found. It is important to know the market, but it is also important to think solution-oriented and be emphatic (Werkgroep Innovatiegericht Inkopen, 2022). Specialised skills are needed to choose the appropriate tender and contract design (Iossa et al., 2018). All these challenges are also being found across countries (Izsak & Edler, 2011). The selection and training of qualified personnel engaged in the process is a complex and ongoing endeavour.

- **Time constraints**: Time consumption significantly hinders the successful realisation of PPI practices (Amann & Essig, 2015; Mwesiumo et al., 2019). A typical procurement of innovation is longer than any corresponding standard procurement process, and procurers often seem to lack time to complete the process carefully. Besides, it is more complex and involves uncertainty concerning the results and the required

time to develop innovations (Sánchez-Carreira et al., 2019, p.122). Countries also emphasise the challenges related to the insufficient time available. Procurement officials often favour fast results over timely solutions (OECD, 2017, p.48). Time constraints could also inhibit the learning and exchange of knowledge necessary to develop a prototype (Brogaard, 2017, p.151).

- **Lack of openness to new ideas**: Georghiou et al. (2014) and Uyarra et al. (2014) have observed that procuring organisations do not allow variations or alternative proposals regarding PPI. In a survey question regarding the openness of the public sector to consider unsolicited ideas from the market, 74% of the respondents disagreed with this statement (Uyarra et al., 2014). Likewise, (Georghiou et al., 2014) concluded that the public sector is significantly less open to new ideas than the private sector, with 63.7% of respondents indicating this stance. The reluctance for new ideas constrains the innovation potential.

- **Lack of incentives**: According to Iossa et al. (2018, p.746), the necessary conditions for PPI to be successful are the presence of incentive schemes to motivate procurers to take appropriate risks. Relying on the intrinsic motivation of procurers is unlikely to suffice. As mentioned, procurers are typically risk-averse and thus decline to take risks unless explicit incentives exist. Therefore, the absence of these explicit incentives is a barrier to innovation.

| Factors | References |
|---|---|
| Lack of knowledge about PPI and technologies | Caloghirou et al. (2016), Georghiou et al. (2014), Iossa et al. (2018), Izsak and Edler (2011), OECD (2017), Plepys and Richter (2016), Sánchez-Carreira et al. (2019), Timmermans and Zabala-Iturriagagoitia (2013), Uyarra et al. (2014), and Werkgroep Innovatiegericht Inkopen (2022) |
| Time constraints | Amann and Essig (2015), Brogaard (2017), Mwesiumo et al. (2019), OECD (2017), and Sánchez-Carreira et al. (2019) |
| Lack of openness to new ideas | Georghiou et al. (2014) and Uyarra et al. (2014) |
| Lack of incentives | Iossa et al. (2018) |

Table 3.5: Intra-organisational barriers

The drivers in the intra-organisational domain are as follows, as also summarised in Table 3.6:

- **Competent staff (technical, process, and procedural competences)**: A PPI organisation should have in-depth knowledge to facilitate developing, evaluating, selecting, and implementing the most desirable solution (Wesseling & Edquist, 2018). Wesseling and Edquist (2018, p.500) assert that procuring organisations should cultivate such expertise in-house as external private organisations may hold different priorities and risk perceptions. Concurrently, Rolfstam (2013) emphasises that successful

public procurement projects require sufficient technical expertise, particularly for applying functional specifications. In addition, the procurer needs to have a clear understanding of the intended project outcomes. Case studies have shown that this will contribute to developing and testing prototypes in the context of PPI projects (Brogaard, 2017).

- **Institutional match**: Rolfstam (2013) introduced the concept of institutional match as a success factor of PPI. It means that different endogenous institutions among different organisations have compatible rationalities. In the case study of Zelenbabic (2015), the institutional match was also a success factor. There was a match between what the supplier wanted to offer and the endogenous need/demand from the procuring department.

| Factors | References |
|---|---|
| Competent staff (technical, process, and procedural competences) | Adjei-Bamfo et al. (2023), Caloghirou et al. (2016), OECD (2017), Rolfstam (2013), and Saastamoinen et al. (2018) |
| Institutional match | Rolfstam (2013) and Zelenbabic (2015) |

Table 3.6: Intra-organisational drivers

### 3.3.3 External and environmental factors

External and environmental factors in the context of PPI encompass obstacles and facilitators from broader institutions such as the industry sector, society or innovation system (Smith et al., 2019, p.120). The external factors could operate within regional, national, or even supranational spheres and could significantly influence the success of innovation procurement initiatives.

There is not an abundance of external factors that hinder PPI. The following factor has been mentioned most in the literature, as also shown in Table 3.7:

- **Political interference**: The potential barrier of political interference emerges as a concern for the success of PPI. In a case study conducted by Wesseling and Edquist (2018), a PPI project resulted in significant cost increases and time delays when a minister, contrary to expert opinions, insisted on a sudden cost cut in the product's development. The Economic and Social Council (2021) refers to a lack of political leadership as a hindrance when writing about political interference.

- **Regulations**: Since implementing the 2014/24/EU directive, regulation has been mentioned as a barrier on only two occasions. Selviaridis (2020) notes that regulatory constraints impact SMEs' ability to compete in public procurement of innovation, but their paper lacks specific details about these constraints. Meanwhile, Melander and Arvidsson (2020) suggest that regulations are barriers to innovation due to their inherent complexity. The many rules and regulations to follow complicate the

engagement in PPI. This complexity often discourages suppliers from participating in innovation competitions.

| Factors | References |
|---|---|
| Political interference | Economic and Social Council (2021) and Wesseling and Edquist (2018) |
| Regulations | Melander and Arvidsson (2020) and Selviaridis (2020) |

Table 3.7: External and environmental barriers

Even though there are only limited external factors that hinder PPI, there are also not many drivers that literature spotted (see Table 3.8 as well):

- **Political support**: Various authors observe political support and commitment as important drivers of PPI success. Adjei-Bamfo et al. (2023) and OECD (2017) refer to the importance of maintaining a stable political commitment. Rolfstam (2013) offers a slightly different perspective and writes about political leadership. According to him, political support enhances the likelihood of securing sufficient resource allocation.

  This viewpoint aligns with the findings of Zelenbabic (2015, p.275), who noticed that political support was instrumental in allocating resources for a six-month pilot project and the subsequent large-scale diffusion. Moreover, the alignment of the project with the governmental strategy positively affected its success.

- **Support and incentive programmes**: Only scarcely mentioned in academic literature, Mwesiumo et al. (2019, p.264) uncovered that national and European support and incentive programmes play a pivotal role in the successful implementation of PPI. These programmes enable the implementation of PPI by providing financial resources and training programmes. Participants in the research of Mwesiumo et al. (2019) even indicated that some of the PPI projects would not have become reality without national or EU support programmes (such as Horizon 2020).

| Factors | References |
|---|---|
| Political support | Adjei-Bamfo et al. (2023), OECD (2017), Rolfstam (2013), and Zelenbabic (2015) |
| Support and incentive programmes | Mwesiumo et al. (2019) |

Table 3.8: External and environmental drivers

### 3.3.4 Organisational factors

Organisational factors in public procurement of innovation refer to elements that originate from the procuring firm and influence its ability to adopt PPI practices. Examples of

factors could be the internal processes, the decision-making structures and the firm's culture.

There is a manifold of barriers in the organisational category. The prevailing ones are the following, as also included in Table 3.9:

- **Too prescriptive specifications**: The research of Georghiou et al. (2014) and Uyarra et al. (2014) indicates that prescriptive specifications hinder innovation. 72.4% of respondents experienced this barrier as very significant or moderately significant.

- **Lack of a champion**: A lack of commitment and involvement from top management often diminishes the interest and support for innovation and can hinder collaborative efforts (Werkgroep Innovatiegericht Inkopen, 2022). In the case study of Rolfstam et al. (2011), the absence of a technology champion willing to promote innovation emerged as a notable institutional barrier.

- **Complexity**: Complexity embodies a significant hindrance to the successful realisation of PPI practices. Through a strongly regulated procurement process and the interaction of a diversity of stakeholders, complexity occurs (Amann & Essig, 2015; Economic and Social Council, 2021)

- **Fragmentation**: This factor refers to the disintegration or division of responsibilities and decisions across different organisational units, departments, or levels. A centrally made decision may not necessarily lead to adoption in the lower layers of the organisation (Rolfstam et al., 2011). Many government departments are involved in planning and implementing public procurement of innovation solutions Izsak and Edler (2011) and OECD (2017). The fragmented approach can also reduce the effectiveness of cooperative R&D and its subsequent exploitation.

- **Organised scepticism**: Procurement staff sometimes demand high proof before adopting an innovation. Case studies have revealed instances where managers and staff expressed scepticism towards the new system's efficiency (Rolfstam et al., 2011) and the claimed properties of a product (Zelenbabic, 2015). Some argue that innovation should undergo market testing, particularly on international markets, before gaining full acceptance (Izsak & Edler, 2011).

- **Financial value**: Price-related challenges have garnered significant attention among scholars. The emphasis on price rather than quality is what firms overwhelmingly complain about, with quantitative research showing that 59.3% find this a very significant issue. An additional 27.4% find it a moderately significant issue (Georghiou et al., 2014). Similarly, Pelkonen and Valovirta (2015) and Melander and Arvidsson (2020) found that price was still the most important award criterion. Among suppliers, there was a wish for other parameters to be included such that price was not the only deciding factor. However, project leaders or managers are often directed to

focus on cost considerations, which leads them to adopt a conservative stance when assessing the risks of possible cost overruns (Werkgroep Innovatiegericht Inkopen, 2022). Typically, the costs are preceded by the benefits and PPI projects are often associated with higher-than-usual costs (OECD, 2017). Another issue related to finances is so-called silo budgeting. Public organisations usually favour the lowest purchasing price and accept higher maintenance costs (Zelenbabic, 2015). Some departments bear the brunt of the costs, while the savings are passed on to other departments (Rolfstam et al., 2011). Finally, PPI projects are often more difficult and require more staff to complete a tender (Mwesiumo et al., 2019). Purchasing departments often do not have the financial resources to employ that many people on such a project.

- **Risk-averse behaviour**: Managing risks in public procurement of innovation requires both a change of attitude and a change of method, as there currently seems to be a poor management of risk (Tsipouri et al., 2010; Uyarra et al., 2014). Procurers know the risks and have much to lose and little to gain. 73.2% of suppliers disagree with the statement that public procurers are willing to take risks, 64.7% think that public sector customers are more reluctant to take risks compared to private customers, and 75.6% categorise risk aversion as a (moderately) significant barrier to innovation (Georghiou et al., 2014).

  Both Mwesiumo et al. (2019) and Melander and Arvidsson (2020) indicate that risk adversity is a reason to refrain from implementing public procurement of innovation. Some organisations seem afraid to fail due to the newness of PPI practices. They do not know the outcomes of the projects upfront and are afraid that the new solution might not be delivered on time, cost more, or not work (Whyles et al., 2015, p.294). Public organisations often push the risk element of PPI to suppliers (Adjei-Bamfo et al., 2023). The risk aversion behaviour within the public sector collectively slows down or even impedes innovation among small firms (Selviaridis, 2020). Brogaard (2017) also concluded that in the case of PCP, the model induces a risk-averse behaviour on the part of the public organisation. According to Whyles et al. (2015), a possible way to manage the risks would be to use Forward Commitment Procurement (FCP). This methodology provides an incremental framework where customers and suppliers can approach PPI in a staged process.

| Factors | References |
|---|---|
| Too prescriptive specifications | Georghiou et al. (2014) and Uyarra et al. (2014) |
| Lack of (technology) champion | Rolfstam et al. (2011) and Werkgroep Innovatiegericht Inkopen (2022) |

| | |
|---|---|
| Risk-averse behaviour | Adjei-Bamfo et al. (2023), Brogaard (2017), Georghiou et al. (2014), Melander and Arvidsson (2020), Mwesiumo et al. (2019), Selviaridis (2020), Tsipouri et al. (2010), Uyarra et al. (2014), and Whyles et al. (2015) |
| Financial value | Georghiou et al. (2014), Melander and Arvidsson (2020), Mwesiumo et al. (2019), OECD (2017), Pelkonen and Valovirta (2015), Rolfstam et al. (2011), Werkgroep Innovatiegericht Inkopen (2022), and Zelenbabic (2015) |
| Organised skepticism | Izsak and Edler (2011), Melander and Arvidsson (2020), Mwesiumo et al. (2019), OECD (2017), Rolfstam (2009), and Zelenbabic (2015) |
| Fragmentation | Izsak and Edler (2011), OECD (2017), Rolfstam et al. (2011), and Selviaridis (2020) |
| Complexity | Amann and Essig (2015) and Economic and Social Council (2021) |

Table 3.9: Organisational barriers

The driving organisational factors are the following. They have been summarised in Table 3.10 as well:

- **Outcome-based specifications**: How specifications are formulated greatly influences the project's outcome. Appropriately identifying and specifying needs is essential for the beneficial implementation of PPI practices (Caloghirou et al., 2016; Iossa et al., 2018). There is little chance that descriptive technical specifications will stimulate the market to come forward with an innovative solution. With descriptive specifications, the public procurer prescribes the detailed technical solution and takes full responsibility for the quality and performance levels of this solution (European Commission, 2021). Public procurers should rather use outcome-based specifications, allowing suppliers to propose solutions that may otherwise be excluded from the tender process (European Commission, 2014a). 59% of suppliers in the UK believe that using these outcome-based specifications encouraged innovation (Georghiou et al., 2014). Procurers could put an unmet need in a procurement call and use a market-sounding process to engage the supply chain. This approach could help the procurement department clarify the needs of the procurement process and draft the specifications (Zelenbabic, 2015, p.273). An initial broader formulation of needs will also facilitate creativity and enable a broad range of solutions (Wesseling & Edquist, 2018).

- **Political and technical champions**: Individuals or groups acting as (technology) champions are a common feature of successful PPI (Rolfstam, 2013). So-called champions encourage and support the introduction and diffusion of the procured item. They could introduce the necessary coordination and engage with external actors while promoting the benefits internally and externally (Talebi & Rezania, 2020). Another driving factor of champions is that it takes away some of the associated risks of PPI from the employees. Champions are usually in a management position and could create an environment with "permission" to fail if something goes wrong

(Mwesiumo et al., 2019). In the case study of Zelenbabic (2015), the supplier acted as a technology champion during the pilot project and provided day-to-day support.

| Factors | References |
|---|---|
| Outcome-based specifications | Caloghirou et al. (2016), European Commission (2014a), Georghiou et al. (2014), Iossa et al. (2018), Wesseling and Edquist (2018), and Zelenbabic (2015) |
| Political and technical champions | Mwesiumo et al. (2019), Rolfstam (2013), Talebi and Rezania (2020), and Zelenbabic (2015) |

Table 3.10: Organisational drivers

## 3.4 Formulated hypotheses

The literature review provides insights regarding the main hindrances and drivers of public procurement of innovation. Some factors were more prevalently expressed compared to others, and there seems to be some overlap. Lack of knowledge is, for example, a regularly mentioned barrier, while competent staff is found to be an essential driver. Based on the many drivers and hindrances found in the literature, a set of hypotheses and a corresponding conceptual framework is proposed:

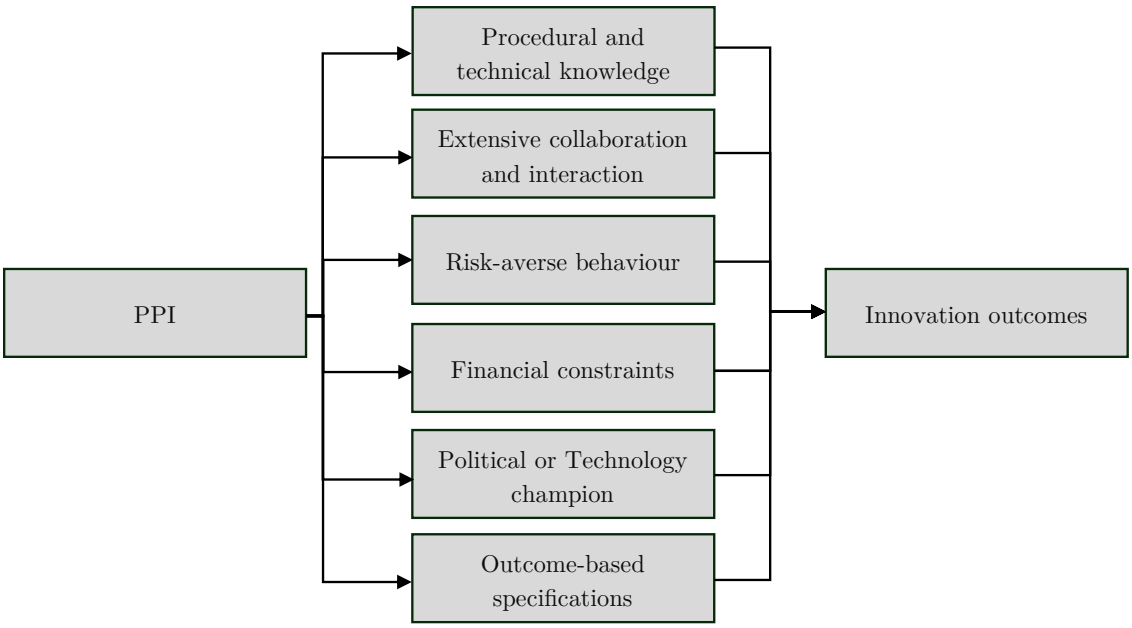


Figure 3.2: Hypotheses

- H1: Knowledge (or the lack thereof) about innovation procedures and technical expertise would be perceived as a strong driver or barrier to a successful innovation outcome.

- H2: Extensive collaboration and interaction (or the lack thereof) would be perceived as a strong driver or barrier to a successful innovation outcome.
- H3: Risk-averse behaviour would be perceived as a strong barrier to a successful innovation outcome.
- H4: Financial constraints would be perceived as a strong barrier to a successful innovation outcome.
- H5: A political or technology champion would be perceived as a strong driver of a successful innovation outcome.
- H6: Outcome-based specifications (or the lack thereof) would be perceived as a strong driver or barrier to a successful innovation outcome.

# 4

# Research Methodology

## 4.1 Research design

This study adopts a mixed-method research design, allowing for a comprehensive overview of the drivers and barriers of public procurement of innovation. Combining qualitative and quantitative data enables triangulation of the findings and a more robust exploration of the research topic. Moreover, obtaining data through different sources could augment the reliability and validity of the data and, consequently, its interpretation.

The data being used for this research has been collected by a group of academics before and during an international study of public procurement. Even though the quantitative data has been collected before the qualitative data, the data strands are analysed separately. Therefore, the research follows a convergent mixed-method research design (Harrison, 2013). Questions often related to this type of method are: "To what extent do the qualitative results confirm the quantitative results?".

This research will analyse the data streams separately and mix them in a concluding section. The results from the literature research, as described in the previous section, will also be added to the overview. The results will give an exhaustive list of barriers and drivers of PPI. The results of this research will be further validated by performing a set of interviews. The interviews will be held with a group of participants who closely resemble the subjects in the initial phase of the research.

## 4.2 Data collection

The International Research Study of Public Procurement (IRSPP) is a collaborative research initiative to investigate public procurement practices across different countries and identify common themes, challenges, and opportunities in the field (Harland et al., 2013). The study acknowledges the need for input from senior practitioners for research, and every two years, they assemble a selection of senior practitioners from countries and organisations to exchange ideas through a workshop. Each workshop and subsequent analysis will concern itself with a different topic. IRSPP8 concentrated on how public procurement

engaged in innovation initiatives and was hosted in Cardiff, United Kingdom.

### 4.2.1 Quantitative: survey

Before the start of the workshops, a questionnaire was sent out to all participants. The questionnaire was designed to take no longer than 20 minutes to complete. It consisted of three sections: (a) general information about the public procurement institution, (b) public procurement for innovation projects, and (c) government innovation policy. Most sections have closed-ended questions with an ordinal scale from 1-5. The questionnaire had 142 respondents, all senior practitioners, as shown in Table 4.1.

| | N | % |
|---|---|---|
| Valid | 139 | 97,9 |
| Excluded | 3 | 2,1 |
| Total | 142 | 100 |

Table 4.1: Sample size questionnaire

### 4.2.2 Qualitative: case study presentations

During the three-day research workshop in Cardiff, participants were required to present an in-depth case study of an innovation project within public procurement. Each participant had to follow the presentation template provided beforehand to ensure the comparability and analysis of projects/cases. The presentation had to contain 18 slides with information about the project, policy instruments, achievements, drivers, and challenges.

The slides presented by the countries are unavailable, but minutes have been taken from each presentation. These minutes are categorised following the 18 slides that have been presented. A total of 17 distinct countries presented their findings, and since most qualitative datasets reach saturation between 9 and 17 interviews (Hennink & Kaiser, 2022), the presented data is sufficient for further analysis.

### 4.2.3 Qualitative: interviews

For the validation of IRSPP data, ten interviews were conducted with practitioners and academics in the field of PPI. Each interview last between 30-45 minutes. Qualitative data collection is chosen over other methods because it provides richer data, offering deeper insights into the reasoning behind the barriers and drivers. Additionally, it helps to identify the best ways practitioners and academics believe these barriers can be overcome. Other qualitative methods, such as focus groups, were deemed impractical due to the international nature of the participants. The list of participants is displayed in Table 4.2.

| Reference ID | Sector | Role | Country |
|---|---|---|---|
| I1 | Government | Project Manager Programme for Innovation Procurement | Belgium |

| | | | |
|---|---|---|---|
| I2 | Government | Coordinator Innovative Public Procurement | Netherlands |
| I3 | Government | Senior Advisor Innovation Procurement | Norway |
| I4 | Academia/Industry | Associate Professor and Consultant Public-Private Partnership | Slovenia |
| I5 | Government | Tender Manager | Netherlands |
| I6 | Government | Municipality Director | Bulgaria |
| I7 | Academia | Full Professor in public procurement | Hungary |
| I8 | Government | Contract Manager | Netherlands |
| I9 | Government | Ministerial Adviser in innovation policy | Finland |
| I10 | Government | Project Manager innovation | Netherlands |

Table 4.2: Records of interviews

## 4.3 Data sampling

### 4.3.1 Quantitative: survey

Questions from section (b) were considered most useful. They explicitly describe the drivers and challenges that practitioners face. The following sections have been included for data analysis:

1. In your view, please rate what your institution achieved operationally through this innovation project: 8 questions, with an ordinal five-number scale from "not achieved at all" to "exceeded expectations".

2. In your view, please rate how much the innovation project contributed to the strategic and policy objectives of your institution: 8 questions with an ordinal five-number scale from "not at all" to "a very large extent".

3. Please rate to what extent the following factors constrained the execution of the project and its outcome: 11 questions with an ordinal five-number scale from "not at all" to "a very large extent".

All other questions have been excluded from the data analysis and, thus, this research.

### 4.3.2 Qualitative: case study presentations

Not all 18 slides contain relevant information for deducting drivers and barriers. The following slides and accompanying minutes will be used for this research:

1. Drivers and Public Procurement Involvement

2. Achievements

3. Challenges

The first two slides are useful for finding the drivers, while the third slide will serve as data to identify the challenges. The other data fields have also been checked, and snippets from these fields provide useful data to analyse. These data fields will be handled individually. The other slides/minutes are irrelevant and will be excluded from further research.

### 4.3.3 Qualitative: interviews

The sample of experts is made of procurement professionals and academics. Since the IRSPP is an international panel of procurement officials and academics, the goal of the interview is also to reflect this sample. Therefore, experts from OECD countries are invited to partake in the interview process. To find the right sample of participants, LinkedIn is used to find people that have considerable experience (3+ years) in the field of PPI. A list of 32 potential candidates was created. The goal was also to create a balanced sample in terms of gender, so this also played a role in the list of candidates, similarly to the country that they are from. Eventually four men, and six women joined the interview process, from 6 different countries. Following the guidelines Hennink and Kaiser (2022), saturation is reached between 9 and 17 interviews. Therefore, the sample size of 10 is considered to be sufficient.

The sample of experts consists of procurement professionals and academics. Since the IRSPP is an international panel of procurement officials and academics, the goal of the interviews is to reflect this diversity. Therefore, experts from OECD countries were invited to participate in the interview process.

To identify suitable participants, LinkedIn was used to find individuals with significant experience (three or more years) in the field of PPI. This search resulted in a list of 32 potential candidates. Efforts were made to ensure a balanced sample in terms of gender and country representation. Ultimately, four men and six women from six different countries participated in the interviews.

Following the guidelines of Hennink and Kaiser (2022), saturation is typically reached between 9 and 17 interviews. Therefore, a sample size of 10 is considered sufficient.

## 4.4 Data operationalisation

### 4.4.1 Quantitative: survey

To operationalise the survey data, all questions and sections of the survey were reviewed. One section focused on the drivers, while another addressed the barriers. These have been used as the Independent Variables (IVs), while the operational achievements section serves as the Dependent Variable (DV), representing the operationalisation of PPI success. The operational achievement questions have been aggregated into a single composite variable, whereas the questions related to barriers and drivers have been treated as

separate independent variables. Figure 4.1 illustrates the structure of these variables within the analysis.

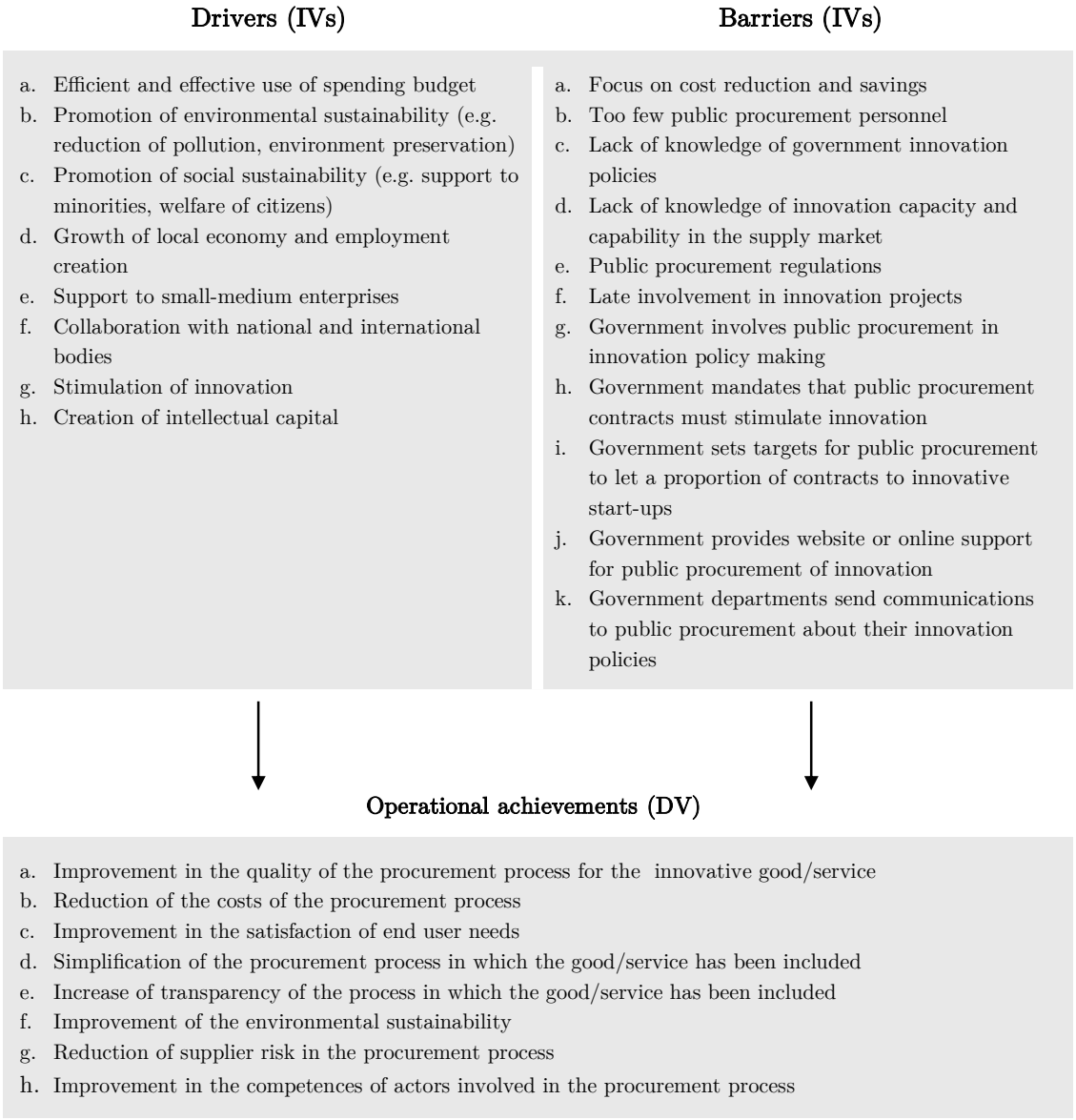


Figure 4.1: Operationalisation of quantitative data

## 4.5 Data analysis

### 4.5.1 Quantitative: survey

All dimensions of the strategic achievements question section are aggregated to create one composite variable of "strategic achievements". This composite variable could then serve as the DV. The distance between each adjacent variable level is assumed to be the same to allow for a stepwise linear regression. The questions about barriers and drivers are the IVs that must be tested.

Principal component analysis is used to determine relevant components to reduce the dimensionality. The Principal Component Analysis (PCA) is a method that measures how each variable is associated with one another by performing an eigen decomposition on the data covariance matrix. Reducing the number of variables makes understanding and interpreting the data easier. The Kaiser-Meyer-Olkin (KMO) and Bartlett tests show the suitability of the dataset for factor analysis. The KMO examines the strength of the partial correlation between the variables. The measuring sampling adequacy was 0.855, above the recommended value of 0.6. It can be considered meritorious with a value between 0.8 and 0.9 (Kaiser & Rice, 1974). Barlett's test of sphericity tests the null hypothesis that the correlation matrix is an identity matrix. For this dataset, Barlett's test gives a p-value below 0.01.

The Kaiser criterion and scree test were used to determine the number of components. The pattern matrix shows the presence of two components (see Appendix B. Most of the six clustered dependent variables concern external actors, the suppliers. They range from improving the satisfaction among end-users to creating more process transparency. Hence, it has been decided to rename this DV to supplier satisfaction. The second cluster, consisting of two DVs, concerns the procurement process. Hence, the naming of procurement process efficiency.

| Test | Value | Outcome |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy | | 0,855 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 490,033 |
| | df | 28 |
| | Sig. | <,001 |

Table 4.3: Kaiser-Meyer-Olkin test

As indicated, the PCA is followed by a regression analysis showing the sufficiency of each variable. In this research, we will also consider the necessity of all variables. Determining the critical factors that must be present for achieving the desired policy outcomes is helpful. This analysis will be done with the help of a Necessary Condition Analysis (Dul, 2016).

The Necessary Condition Analysis (NCA) is a condition that must be present or absent to enable a certain outcome. Without the condition, the outcome will not be there. The condition has interesting managerial implications, as it helps decision-makers understand the critical elements that must be maintained to ensure success.

NCA is an analytical tool that can be used alongside traditional data-analytic tools such as correlation or regression analysis to better understand the relations between variables. To determine the necessity of each factor, the ceiling line will be analysed, which defines the upper boundary of possible outcomes given the presence of the necessary condition.

### 4.5.2 Qualitative: case study presentations

A coding framework was developed through deductive and inductive coding. Codes from the literature will be used a-priori, while the remaining codes emerged from the data inductively. This dual process allows the most information to be extracted from the data. After breaking down the data into smaller segments – the open coding – axial coding is applied to find further relationships and connections between the codes. The code will be continuously reviewed and refined to revise further and consolidate codes, themes, and categories.

### 4.5.3 Qualitative: interviews

To analyse the interviews, template analysis was chosen as the primary method for analysis (King & Brooks, 2017). In organisational studies, two predominant templates for coding interviews are the Gioia method (Gioia et al., 2012) and the Eisenhardt method (Eisenhardt & Graebner, 2007). However, a drawback of these methods is that they are most effective for purely inductive research. Since this study employs a hybrid approach - combining both inductive and deductive coding - template analysis is a more suitable choice.

Template analysis uses a predefined set of codes derived from the literature, which are then updated or modified as new themes emerge. The codebook is provided in the Appendix. For the coding process, the coding manual by Saldaña (2016) was used as a guide.

## 4.6 Validity and reliability

Validity and reliability – or quality criteria - for quantitative and qualitative data require different measures due to their diverse nature. Guba (1981) identified four factors for assessing quality in quantitative research: (a) internal and (b) external validity, (c) reliability, and (d) objectivity. A corresponding set of criteria of trustworthiness was created for qualitative research: (a) credibility, (b) transferability, (c) dependability, and (d) confirmability.

### 4.6.1 Quantitative: survey

The sample population of the questionnaire is rather homogeneous - all being senior practitioners in the field of public procurement. Restricting the sample population like this will likely reduce the impact of confounding variables. Internal validity is further strengthened by the design of the questionnaire. The questions have been designed by a group of academics with knowledge of the field of research, and standardised scales have been used.

The respondents of the questionnaire include practitioners from various backgrounds, such as different types of public procurement institutions and different countries, thus

strengthening external validity. Moreover, the sample size increases the confidence in external validity. The dataset contains 142 ordinal data entries with values ranging from 1-5. The principal component analysis also establishes the presence of construct validity. The reliability of the research is partly ensured by the design of the questionnaire. The items in the survey are ambiguous and seem to measure the intended construct. Moreover, the internal consistency is also tested, with Cronbach's alpha being 0.857. According to research, the acceptable values of the alpha range from 0.70 to 0.95. If the value is much higher than 0.90, it may suggest that some items are redundant as they test the same question but are differently formulated (Tavakol & Dennick, 2011).

For the objectivity of the responses, standardised procedures for filling out the data ensure a consistent and objective data collection. It has been stressed that the survey is anonymous and confidential, stimulating honest and objective answers.

### 4.6.2 Qualitative: case study presentations

Data triangulation helps validate and strengthen the credibility of the findings by converging multiple data points. The quantitative analysis serves as a so-called methodological triangulation. The analysis will also serve as a measure to increase the confirmability of the study.

To transfer – i.e. generalise the study's results – to other studies, the research provides a thick description of the context to other possible contexts. Besides that, an audit trail with a running account of the process is provided. The audit trail allows an external person to examine the data analysis process and ensure dependability.

### 4.6.3 Qualitative: interviews

Regarding the interviews, they help strengthen the findings from previous data sources, increasing the confirmability of the study. Dependability is ensured by including the codebook with definitions and examples for use by future researchers.

# 5

# Results

## 5.1 Quantitative results: regression analysis and NCA

### 5.1.1 Clustering

The questionnaire respondents have different roles in public procurement, ranging from public organisation management roles to national procurement centre experts. The questionnaire is anonymous, and it is impossible to make distinctions between groups ourselves. Nevertheless, different responses could exist among groups.

Performing a (hierarchical) cluster analysis, based on the average linkage between groups, allows for bucketting the respondents into two clusters. The first cluster (n=127) is significantly larger than the second (n=12), but the respondents of each cluster respond differently to the list of questions.

### 5.1.2 Regression and NCA

The objective is to examine whether each combination of factors and clusters leads to sufficient and necessary conditions. A stepwise regression is conducted to determine the sufficient conditions of the variables, while a NCA is being employed to ascertain critical conditions (see the code below). NCA extends the scope of traditional regression analyses and Qualitative Comparative Analysis (QCA), allowing the identification of "critical" determinants that must be present to achieve desired outcomes (Dul, 2016, p.41).

```
nca_analysis(Regression_BA,c(1:19),20,ceilings="ce_fdh",test.rep=10000)
nca_analysis(Regression_BA,c(1:19),21,ceilings="ce_fdh",test.rep=10000)
```

For the second cluster (n-=12), no sufficient conditions could be identified for either factor, while the first cluster (n=127) shows significant results for both factors. Therefore, the respondents of the second cluster are excluded and the analysis is continued with only the other cluster.

The results for the regression and NCA are displayed in the Tables 5.1 and 5.2. All variables that have been excluded can be found in Appendix C. For the NCA – to obtain

the distribution of the effect sizes under the assumption of the null hypothesis – a large number of random samples are generated. With 10,000 samples, all variables have a p-accuracy below 0.05. In line with Dul (2016), the effect size will be evaluated as follows: 0<d<0.1 as a "small effect", 0.1≤d<0.3 as a "medium effect", 0.3≤d<0.5 as a "large effect", and d≥0.5 as a "very large effect".

| | | *Regression* | | *NCA* | |
|---|---|---|---|---|---|
| **B/D** | **Independent variable** | **Beta** | **Alpha** | **Beta** | **Alpha** |
| Driver | Promotion of social sustainability (e.g. support to minorities, welfare of citizens) | 0,217 | 0,005 | | |
| Driver | Efficient and effective use of spending budget | 0,271 | 0,001 | | |
| Barrier | Public procurement regulations | -0,389 | <0,001 | | |
| Barrier | Too few public procurement personnel | 0,237 | 0,006 | | |
| Barrier | Lack of knowledge of government innovation policies | 0,214 | 0,009 | 0,167 | 0,043 |
| Driver | Stimulation of innovation | 0,195 | 0,025 | 0,250 | 0,003 |

Table 5.1: Regression and NCA of procurement process efficiency

| | | *Regression* | | *NCA* | |
|---|---|---|---|---|---|
| **B/D** | **Independent variable** | **Beta** | **Alpha** | **Beta** | **Alpha** |
| Driver | Efficient and effective use of spending budget | 0,285 | <0,001 | 0,417 | <0,001 |
| Driver | Promotion of social sustainability (e.g. support to minorities, welfare of citizens) | 0,205 | 0,007 | 0,200 | 0,002 |
| Driver | Stimulation of innovation | 0,365 | <0,001 | | |
| Driver | Growth of local economy and employment creation | 0,248 | 0,002 | 0,217 | 0,003 |
| Driver | Creation of intellectual capital | -0,233 | 0,002 | | |
| Barrier | Focus on cost reduction and savings | 0,131 | 0,045 | | |
| Driver | Collaboration with national and international bodies | | | 0,133 | 0,019 |
| Driver | Creation of intellectual capital | | | 0,133 | 0,012 |
| Driver | Support to small medium enterprises | | | 0,133 | 0,043 |
| Barrier | Lack of knowledge of innovation capacity and capability | 0,167 | 0,049 | | |

Table 5.2: Regression and NCA of stakeholder satisfaction

In Table 5.1 and 5.2 The beta is the standardised coefficient beta or effect size, while the alpha represents the corresponding p-value. All variables with a p-value >0.05 have been excluded.

Additionally, a check for multicollinearity was conducted to examine whether there is any correlation between the independent variables in the multiple regression model. The Variance Inflation Factor (VIF) is one method used to determine the degree of multicollinearity. There is no consensus among methodological researchers on the most appropriate cutoff score. Some researchers state that a value above 10 indicates the presence of multicollinearity, while others argue for a more subjective interpretation. Even when considering other factors, such as sample size and variance as suggested by O'brien (2007), it can be safely assumed that there is no multicollinearity. None of the VIF values

exceed 1.706. Considering the other factors, these are low values. All VIF values can be found in Appendix C.

### 5.1.3 Explanation of quantitative findings

As seen in Table 5.1 and Table 5.2, some factors are not only sufficient but also necessary conditions.

Firstly, a lack of knowledge is a necessary condition for procurement process efficiency. This finding does not imply that a lack of knowledge is required for PPI success. Rather, it indicates that if a lack of knowledge is present, achieving PPI success becomes impossible. However, the low effect size (d = 0.167) suggests that it may not be the strongest necessity.

Conversely, the efficient and effective use of the spending budget has a stronger effect size (d = 0.417), suggesting that it is a necessary condition for driving PPI. There are also other drivers that serve as necessary conditions, but they have weaker effect sizes.

Another insight worth further discussion is the negative beta of the creation of intellectual capital. This result suggests that an increase in the creation of intellectual capital is associated with lower stakeholder satisfaction. This could indicate that stakeholders prioritise other matters over intellectual capital creation or that it makes the innovation process more bureaucratic. The interpretation and implications of these results will be explored further in the discussion chapter.

Some of the sufficiency results may seem counter-intuitive, similar to the effects of a lack of knowledge. For example, the barrier posed by public procurement regulations has a negative beta, while the barrier of having too few public procurement personnel has a positive beta. This discrepancy arises from the way the independent variables are described. Some variables include negations, such as 'lack of' or 'too few', and should therefore be interpreted the other way around.

## 5.2 Qualitative analysis: Case presentations

During the international research study, participants from various countries engaged in sense-making and case presentations. Each country representative could showcase a project in public procurement of innovation. To facilitate the presentations, a standardised slide deck was employed, enabling country representatives to present their project, highlight its components, motivating factors, challenges, and cross-functional approaches involved. Below you can find the barriers and drivers identified based on the project summaries presented.

### 5.2.1 Barriers

#### Financial/Budget constraints

Budget and financial constraints were identified as major issues for completing PPI projects. Most countries faced budget constraints that limited their ability to fund the various stages of the project. As Belgian representatives indicated, much money was needed to complete the project, and the 2 million euros they were provided with at the start was insufficient. Representatives of Argentina, the USA, The Netherlands, Canada, and Slovenia faced similar challenges. Canadian representatives even mentioned that there was a chance a project would not be evaluated due to insufficient funds to establish an evaluation team. PPI is a costly procedure, and sometimes, the government does not see it as the best value for their money, as Polish representatives indicated. In the Netherlands, they were even faced with a budget reduction, and as they indicated, a small budget will also result in little results. The Wales representative also experienced the challenge that people do not see beyond the price tag.

#### Lack of knowledge

Competencies about innovation capacity hindered the respective projects. Seven country representatives saw lack of knowledge as a limiting factor. Representatives of Slovenia, Italy, and Scotland noticed a lack of knowledge of innovation capacity and capability. Scottish representatives also had a lack of understanding of the innovation partnership process. For Canadian representatives, a level of technical support was needed during times of emergency. The controlling body had to be retaught the new system in the Hungarian project, while in Belgium, a new organisation limited knowledge. Norway did not go into detail but mentioned the lack of competencies as a challenge.

#### Lack of resources

Lack of resources, mostly human resources, makes some projects' completion difficult. In the case presentations, four countries came forward, sharing their concerns about the lack of resources. As mentioned in the paragraph about financial constraints, Canadian representatives lacked funding for an evaluation team. Scottish representatives said that only five people were tasked with innovation in the country. Likewise, Polish representatives mentioned that there usually was only one lawyer and one expert within the project. Resource commitment was also difficult for representatives of the United States as much time had to be put in.

#### Organisational scepticism and risk aversion

Four country representatives see organisational scepticism and risk aversion as challenging. The consensus among the Polish, Welsh, German and Scottish representatives is the reluctance of the organisation to spend money or implement new structures. According

to the Welsh representative, there is an internal and external mistrust. An example is the mistrust between auditors and the finance team. Especially financers do not believe in the benefits of PPI. German representatives mentioned that the main organisation is reluctant to implement new structures. Likewise, Polish representatives notice a reluctance to spend money on experts. Only the Scottish representatives explicitly mention that there is risk in the project and that there is a negative view of risk in the public sector.

#### Functional specifications

For the USA, Romania, Belgium, and Wales, how specifications are formulated plays a challenging role in stimulating innovation. The Dutch representatives mention that the process is rather formal, whereas innovation requires freedom. Similarly, the USA finds it difficult to select challenges since they do not want to limit the project's creativity. Romania mentions challenges with technical specifications, and Wales has difficulties creating outcome measurements.

#### Other

A large variety of barriers have a limited occurrence across countries. German representatives had difficulties activating start-ups to fill out forms and hand in official documents. For Norwegian representatives, there was a lack of interaction between the procurer and the suppliers, while Canadian representatives had difficulties sharing information due to the systems. They indicated, for example, that there was a huge gap between supplier and buyer time expectations. There were also country representatives who indicated challenges regarding communication and coordination. Scottish representatives noticed a poor alignment of structures, whereas Romanian representatives remarked challenges in public-to-public partnerships. Moreover, Welsh representatives saw limited engagement in public procurement.

### 5.2.2 Drivers

#### Support from top leadership

The most frequently mentioned driver is support or initiative from management. Hungarian, American, and Slovenian representatives indicated that senior management provided engagement and support. In the Hungarian project, the support came from the universities' and authorities' senior management. For the Slovenian project, the senior management was especially important in supporting the inter-department collaboration, while the senior management in the USA mostly provided ongoing engagement. The Belgian representative mentioned that the board of administrators supported the project's founding partners, who were the main drivers behind the project. Similarly, in the Scottish case, there was a need from NHS Highland that an Innovation Health Board instigated.

#### Extensive collaboration and interaction

Six different country representatives mentioned collaboration and interaction as drivers for PPI. The Welsh representative recognised the collaboration between suppliers as vital. For the Romanian project, the fervid activity among researchers and technology designers encouraged research entities and R&D&I hubs to gather and develop innovative solutions. Italian representatives focussed more on the important role of collaboration with internal and external stakeholders. At the same time, the German project benefited more from internal collaboration, mostly between the team in charge of project tasks and the legal team. Slovenian and Hungarian representatives mentioned the high level of sharing knowledge and exchanging information on a general level.

#### EU and national incentives

Another driver named several times was the assistance of national and European organisations. As the Slovenian representative mentioned, a main driver for the project was the support from the EU, who provided considerable technical assistance. The other country representatives, from the USA, Poland, and Romania, indicated the driving factor of national incentives. The American representative named the Office of Resilience an encourager of innovation, and Poland's and Romania's representatives mentioned the government's help as a substantial success factor.

#### Other

Analogous to the barriers, some drivers were only mentioned in a few instances. Competent staff was a driver for success in the Welsh and Norwegian projects. In Wales, there was a huge amount of training for the public sector staff and the suppliers. In Norway, the staff was introduced to the concept of innovative procurements and received advice and guidance concerning the implementation. They made sure to pass on knowledge and experience. According to the Belgian representative, a good environment for the suppliers encourages further operations in the future. The German representative expressed the importance of good criteria to choose between possible procurement projects. These better criteria would be helpful in an environment of restricted budgetary means. For Hungary the criteria should allow for variants as this will also boost innovation.

## 5.3 Validation: interviews

As delineated in the methodology (see: Table 4.2), 10 experts participated in the interview process. The main goal of the interview was to validate the IRSPP findings. The other goal was to learn more about the barriers and drivers that the experts experienced in their work or research, and the corresponding mitigating activities they think can help. The complete interview guide is added to Appendix D.

Below, the experts' responses to the IRSPP results are first discussed, before going in detail about the other findings. The barriers and drivers that were discussed during the interview are as follows. From the barriers, it concerned: Risk-averse behaviour, too prescriptive specifications, lack of interaction between suppliers and procurers, regulations, focus on cost reductions and savings, too few public procurement personell. From the drivers, it concerned: Extensive collaboration and interaction, Competent staff, Collaboration with (inter)national bodies, Promotion of social sustainability, Efficient and effective use of spending budget, Support to SMEs, Growth of local economy and employment creation, Stimulation of innovation.

### 5.3.1 Barriers from IRSPP data

Regarding the barriers, the experts largely agreed on most of them. The only barrier they did not recognise was regulation. Most considered it more of a perception than a real barrier.

When asked to prioritise the barriers, risk aversion was mentioned most frequently, followed by the lack of interaction between suppliers and procurers. This lack of interaction is also linked to risk aversion, as experts noted that it often stems from the fear of violating regulations or the concern that a supplier could be excluded from the tender process.

#### Risk-averse behaviour

One of the main reasons for risk-averse behaviour is the public interest and the use of public money to fund these projects. If something goes wrong, someone will be held politically responsible. Procuring organisations do not always conduct well-considered risk analyses. For them, the greatest risk is that the project will fail—something that is always a possibility with innovation:

> *"But I must say, I have encountered few contracting authorities that truly make good risk assessments before making a purchase. And then the most commonly mentioned risk is that the procurement fails. But that should never be the biggest risk in a procurement process."* (I8)

As another participant pointed out, risk aversion also exists in the private sector, but it is perceived as being much stronger in the public sector due to the use of public funds:

> *"So, I think it is always said that this is somewhat stronger in the public sector because we are working with taxpayers' money, because we have to account for our spending, and because the politician we depend on must be able to justify things if they go wrong—which often happens. Whether you purchase something or help develop something, there is always the risk that it turns out to be suboptimal."* (I1)

Finally, another key reason why public organisations are risk-averse is the mindset and personality of procurers, as well as the organisational culture within the public sector.

One participant noted that procurement officials are generally more analytical and less inclined to experiment or try new approaches. Another participant highlighted cultural resistance and the reluctance to embrace innovation:

> *"We prefer to work as we always have. How to improve this, or why is it so slow? Because it was like this when I started working."* (I6)

**Too prescriptive specifications**

Mentioned by several experts, this is considered a significant barrier. In some public organisations, particularly those that operate as project-based organisations, there is a strong tendency to specify every detail of what they want, as noted by one participant:

> *"What stands out very clearly in our case is that we are a project-based organisation. As a result, we are used to approaching projects by first specifying everything in detail: What exactly are we going to do? Where and when? Within what timeframe? And how much is it going to cost? So, from the very beginning, we almost always know exactly what the outcome will be."* (I10)

Another concern raised was that detailed specifications and requirements are often not feasible when dealing with innovation. Public procurers not only want to define everything clearly, but they also require prior references—something that is not always possible for innovative solutions:

> *"References, in particular, remain a big challenge for something that doesn't yet exist or only partially exists but not yet in the required form. You simply can't ask for a reference for an identical previous assignment because it usually doesn't exist yet."* (I1)

**Lack of interaction between suppliers and procurers**

After risk aversion, lack of interaction was mentioned as the most critical barrier. On a project-by-project basis, there may be a lack of awareness about the possibilities for innovative solutions.

> *"Why don't you buy something new and innovative? Well, we didn't know of any other solutions besides the ones we're already buying. Why didn't we know? Because we didn't have any interaction with the suppliers or conduct any market research. So that's also a factor."* (I3)

Many people are afraid to engage with potential suppliers, believing it is against regulations. However, one participant strongly disagreed with this argument:

> *"If you create a good report on what you discuss, you can actually have quite detailed conversations. This means you can gather valuable information from the market. The*

*problem is that people are very afraid of this because they don't really understand why they aren't allowed to talk in the first place or what measures they can take to prevent any issues."* (I8)

**Regulations**

Regulation is not generally seen as a barrier by the majority of participants. Instead, they perceive it as more of a misconception that regulation itself is a barrier. However, as one participant noted, "the lack of EU competitiveness and strategic use of procurement for innovation is one of the main issues at hand". This explains why efforts are being made to simplify procurement directives and why regulation is still *perceived* as a barrier.

Another participant pointed out that the barrier is not necessarily the procurement directive itself but rather the "secondary legislation," such as CSDR:

*"This [secondary] legislation isn't directly related to public procurement, but it does have a significant impact. If you want to use public procurement to enforce all your other green legislation or social legislation, you might think you are on the right track [...] But for a small business, having to provide certificates can be difficult."* (I1)

However, in general, participants did not consider regulation to be a significant barrier, as illustrated by the following statements:

*"Regulation is a coin with two sides. On one side, it gives rights, but on the other side, it puts some requirements. [...] But when there is no regulation and we are free to act, we say we need the regulation. When we have regulation in force, we say it's not good, and we need to change it."* (I6)

*"In our experiences you can do a lot within the current legislative framework, EU framework. And then the question is, what is then the alternative - no regulation at all? Then yes, I'm sure it would be easier. But I think that's not realistic. [...] It's more down to skills and competencies, resources, and how the management of the organisation sees procurement"* (I9)

**Focus on cost reductions and savings**

The majority of participants mentioned the focus on cost reductions and savings as a barrier. They observed that governmental organisations face decreasing budgets while having increasing expectations for public services. This leads to a focus on "value for money," where organisations seek certainty about what they are purchasing. They look at the price of a tender and not at the life-cycle costs:

*"Value doesn't just refer to price—it also includes total cost of ownership and life cycle costs."* (I1)

One participant noted that this factor is more of a perception among organisations that believe innovation is more expensive:

> *"Many governmental organisations believe that innovation is inherently more expensive. But that doesn't have to be the case. As long as they hold that belief, they won't actively purchase or encourage innovation, simply because they assume it costs more."* (I2)

#### Too few public procurement personnel

Related to the focus on cost reductions, there is not enough budget for staffing, and many organisations lack the capacity to initiate PPI procedures. Public procurement officials are already occupied with their regular work and do not have the time to experiment. As a result, normal work is prioritised:

> *"Procurement departments are often understaffed in government organisations, and there simply isn't additional time to experiment with this [i.e. innovation]."* (I2)

### 5.3.2 Drivers from IRSPP data

From the perspective of the drivers, there was greater disagreement regarding their relevance. The experts agreed upon the following items: extensive collaboration and interaction, competent staff, collaboration with (inter)national bodies, support to SMEs, and stimulation of innovation.

The promotion of social sustainability was considered too narrow by the participants and should also encompass other forms of sustainability as well. While the regression and NCA analysis excluded environmental sustainability as a driver, the experts highlighted this as a crucial omission.

The growth of the local economy and employment creation were not seen as drivers for PPI by the participants, who believed these factors also apply to regular procurement and do not specifically drive innovation.

The efficient and effective use of the spending budget was another point of disagreement among participants, given the financial uncertainty of innovation and the unpredictability of its outcomes.

#### Extensive collaboration and interaction

Another aspect mentioned in relation to the barrier of 'lack of interaction' is that collaboration and engagement are essential not only for understanding organisational needs but also for gaining insight into what the market has to offer. One participant did not perceive it as a driver *per se* but noted that it helps lower the barrier to adopting PPI. Another participant highlighted the benefits of interacting with suppliers:

*"Focusing more on targeted and time-efficient interactions can be beneficial. It helps clarify your request for companies while also enabling them to better understand where they can contribute."* (I1)

Interaction and collaboration are not only drivers in the relationship between procurers and suppliers but also in cooperation with other (public) organisations:

*"In Finland, we have approximately 300 municipalities, which are quite independent and responsible for a significant amount of procurement. So there is definitely room for collaboration among municipalities [...] And especially when discussing innovation procurement, collaboration with companies and, to some extent, with research organisations is crucial."* (I9)

**Competent staff**

Know where to find the right people, because they can help you with understanding it

Competent staff is considered an important driver. It helps to understand the procedures, technicalities. Moreover, capacity building helps civil servants to learn about PPI and PCP, and how they need to perform it. And this leads to the courage to experiment. As another participant put it:

*"Driver is the professionalisation. I know exactly that sometimes the handbooks and best practices are so boring, but they show a lot. They can help a lot. So I think that the education, the high level education, of public procurement experts, and strengthening the non-legal aspects could be very good [...] Subject matter specific experts. That is crucial. But they have to communicate. So when I say education, it's not just the education of lawyers, this is the education of those people who are involved in public procurement in order to understand each other."* (I7)

Another reason that competent staff, from both the procurer and supplier side is driving innovation is that competences are needed to build a business case to show the value of an innovation:

*"I see that a great deal of knowledge is required, particularly regarding the concept of the business case - what it is, how to structure it, how to assess it, and what tools can be used by both market parties and clients to ensure that the value of innovation is properly reflected. [...] We are fortunate to have a skilled value engineer who has various tools that can help both market parties and us elevate business cases to a higher level."* (I5)

**Collaboration with (inter)national bodies**

With regard to this driver, most participants did not explicitly disagree with it, but they also did not provide any justification for how it serves as a driver. Only one participant

highlighted the importance of international collaboration in changing the mindset within the organisation:

> *"Being a member of a specialised network focused on this topic can also be beneficial. For example, through our coordination of the Urban Agenda Partnership on Procurement, I have seen how it helps change perceptions and motivates organisations to adopt more innovative procurement approaches."* (I2)

**Promotion of social sustainability**

"For the participants, the promotion of social sustainability was considered too narrow and should also include environmental sustainability, depending on the region. A large majority of the participants supported this addition:"

> *"The promotion of social sustainability is much broader and can include both environmental and social aspects, depending on the place and region. In South Africa, public procurement is primarily focused on social responsibility. In Europe, the emphasis is more on environmental sustainability. In the United States, there is little focus on either."* (I7)

**Efficient and effective spending of budget**

There was some uncertainty among participants regarding this driver. They did not believe that efficient and effective spending is possible in an innovation project, as it is difficult to measure:

> *"How can we determine whether it was efficient or effective? For me, efficient budget spending means something different in the context of innovation. If I have a research project and need to support a researcher, the only thing I can do is procure the necessary resources for research [...] So, the real driver is simply having a budget. That is very important."* (I7)

Moreover, with innovation, it is not always possible to allocate funds in the most efficient way, as not every innovation succeeds:

> *"We decided to launch this innovation partnership to truly encourage companies to innovate. If it fails, then so be it. That means we might not be spending our money efficiently in that case."* (I5)

Overall, the participants did not consider this a driver. However, they did believe that having a budget can encourage the use of innovation. Therefore, from a different perspective, it could be interpreted as a driver.

**Support to SMEs**

Support for SMEs was considered an important driver by all participants, but there was little explanation of the rationale behind it. Two participants mentioned that procurement procedures are often lengthy and complex for SMEs, making support crucial to encourage their participation. One participant stated:

> *"In particular, small companies find these procurement processes cumbersome, lengthy, and unpredictable."* (I9)

Another participant stated something similar:

> *"What is often challenging for SMEs — especially smaller ones that are not yet familiar with platforms like TenderNed or the systems we use at the organisation — is that they require more guidance throughout the procurement process. They need to understand what is expected of them, what requirements they must meet upfront, and how they can demonstrate that they are a reliable party. So yes, it is a driver."* (I5)

**Support from top leadership**

Finally, an important driver mentioned by the majority of participants is management support. It was also ranked highly as a driver in a survey conducted by one of the participants. Although it was accidentally omitted from the list of predefined drivers during the interviews, several participants identified it as a missing element. Therefore, this reinforces the initial findings of the IRSPP data.

As one participant noted, organisations are more likely to follow through with the entire process if there is management or political support in place:

> *"Well, first of all, both top-down and bottom-up approaches are very important in an organisation. By top-down, I mean there must be strong commitment at the political level. [...] If the municipal government or mayor is convinced of an initiative—especially if they have committed to it by signing a letter of intent or a similar document (such as a declaration or commitment statement)—they are more likely to follow through."* (I2)

Another participant, who previously identified risk as a barrier, pointed out that, conversely, management support can help mitigate the fear of failure and drive the initiative forward:

> *"If you have a sponsor at the management level who is open to it and willing to take a risk—without the immediate fear of being penalised, so to speak—that can make a significant difference. This is often a key issue: the fear of getting it wrong. If that fear can be tempered by having a sponsor who says, 'Right, we're going to do this, we're going to take the risk, and if it doesn't work out, then so be it—but at least we tried,' then that becomes a crucial driving force for making it a structural approach."* (I8)

### 5.3.3 Other factors driving or hindering PPI

**Support and incentive programs**

In Belgium, the national competence centre not only offers expertise but also provides monetary funds to help organisations finance the public procurement of innovation procedure. If they see that a project has the potential for significant impact, they support the organisation by covering half of the investment. As one of the participants mentioned, this helps to reduce risk perception and also convinces management to make greater use of these procedures:

> *"We don't just stimulate governments by providing our expertise and guiding them in their purchases, helping them prepare those purchases — we also have funds. [...] If you then issue a tender, receive offers, and can award the contract to the best player, we cover 50% of that contract. The other 50% comes from, for example, the local government or the other government entity that submitted the request to us."* (I1)

Interestingly, this contrasts sharply with the situation in the Netherlands. The Dutch competence centre, PIANOo, has a much broader focus, covering various types of public procurement. However, unlike their Belgian counterparts, they do not have funds available and can only offer expertise. One participant also noted that they are unsure about the expertise that PIANOo has and that they are looking mostly for practical advice from other organisations:

> *"That also relates to the fact that we are specifically looking for subject matter experts who have prior experience with this. So, I genuinely wonder whether an organisation like PIANOo already has that knowledge in place."* (I5)

Besides national support programmes, there is also the possibility of obtaining funding from the European Innovation Council. However, not every country makes use of these funds. One participant from Norway mentioned that access to these funds in their country is a barrier:

> *"There are financial mechanisms available on a European level, for example, through the European innovation council on applying for funding, but the access to that type of money on a regional, local and a national level is a barrier for people to take the risk of trying to make those savings and improvements in public service delivery."* (I3)

There are several reasons why this poses a barrier, as mentioned by the participant. Previously, there were effective national mechanisms available in Norway. Additionally, "EU applications are rather cumbersome and take a lot of resources to prepare". Finally, the mindset towards obtaining European funding in Norway is different, given that the country is not an EU member state.

**Motivation and mindset**

One of the most frequently mentioned drivers of PPI is the motivation, mindset and willingness to do something good. Several participants mentioned it, often using different wordings, but meaning the same thing.

> *"A driver for public procurement of innovation is, in most cases, the wish to do good, to make progress."* (I4)

Besides this intrinsic motivation, it is also the mindset that plays a role, how you look at innovation as a solution for problems. Two participants had different examples regarding this mindset:

> *"For example, I had a class here last week and we had two participants from two different municipalities. One of them came up to me and said: "There is a cut in our budget, so now we can't work with innovation any more". The other municipality came to me and said "There is a cut in our budget, so we need to work with innovation more". [...] So for one it was a barrier, for the one it was a driver."* (I3)

> *"Additionally, it is also influenced by a certain perception that stands in the way. This means, for example, that if you ask about some of the disadvantages of innovation, particularly PPI, the people who respond—ironically, often those who have never actually done it themselves—will confidently tell you that it is more expensive, much more complex, legally unfeasible, or very difficult. They will give you plenty of reasons why it supposedly cannot be done. And, as I said, ironically, these are often people who have never done it themselves. This is their perception, their viewpoint, and that is why they don't pursue it. So, if you want to overcome this, you need to take steps to change that perception."* (I2)

**Time constraints and complexity**

A barrier frequently mentioned during the interviews, which was also noted in the literature but did not appear in the IRSPP data, was the time constraints and complexity of PPI procedures. One participant mentioned a fear for the complex procedures required to procure innovation (I4). As another participant noted:

> *"It really is a lot of work, involving extensive consultations with legal experts to determine what is allowed and what is not. A significant amount of effort is required, particularly because, within an innovation partnership, parties are permitted to engage in discussions with the contracting authority. As a result, a considerable amount of effort is expected from the contracting authority."* (I10)

Another participant highlighted that innovative procurement procedures can be lengthy, often taking more than two years:

> *"In addition, it is, of course, a time-consuming process. If you take pre-commercial procurement, for example, and want to develop such an innovation, it can easily take two years. You need to have the time, the budget, and the support of your managers, among other things."* (I2)

**Lack of knowledge**

In addition to the importance of competent staff as a driver, the lack of knowledge among public procurement staff was also mentioned as a barrier by various participants. One participant indicated that organisations already have difficulties with handling regular procurements:

> *"A lot of what we observe is that the expertise of buyers, even regular buyers, is often quite limited. This depends to some extent on the organisation and its scale, but in smaller municipalities, there is often only one buyer. It is impossible for that person to be knowledgeable in all areas. Even managing regular procurement effectively is already challenging, let alone finding the time, courage, or confidence to take a different approach. So, when it comes to expertise and background. . . there is simply very little of it."* (I1)

Moreover, as indicated by two othe participants, public procurers lack the knowledge about what innovation is, and what is allowed in innovative procedures:

> "I noticed that once I got into a conversation - after about half an hour - people would say, "Oh, it is possible. Oh, and this is how we can do it, and we can handle this part like that". And suddenly, things would start moving. When you ask the right question, it often turns out that it is possible after all." (I8)

> "Contracting authorities think that if they buy something new that it will be immediately innovative. Of course, this is another misunderstanding and that's why I'm starting with these, let's say, barriers that I do think that the understanding, the basic understanding of innovation in public procurement is relatively primitive." (I7)

**Competition-innovation conundrum**

This driver was only mentioned once by a participant, but when included in the questionnaire, a strong majority of the participant agreed of the importance of this driver:

> *"If several economic operators know that maybe the other will take the whole business, they will not share their best ideas. And although they create a prototype, they will not give their best, because they have a fear, high risk, that they finally will not want."* (I7)

## 5.4 Framework with barriers and drivers

The results of the identified barriers and drivers are extensively listed in Appendix E. Sixteen barriers and drivers appear across organisations and should be considered when working on a PPI project. Further discussion on the mitigating actions and enablers has been moved to the discussion section, but a framework illustrating the barriers and drivers is shown in Figure 5.1.

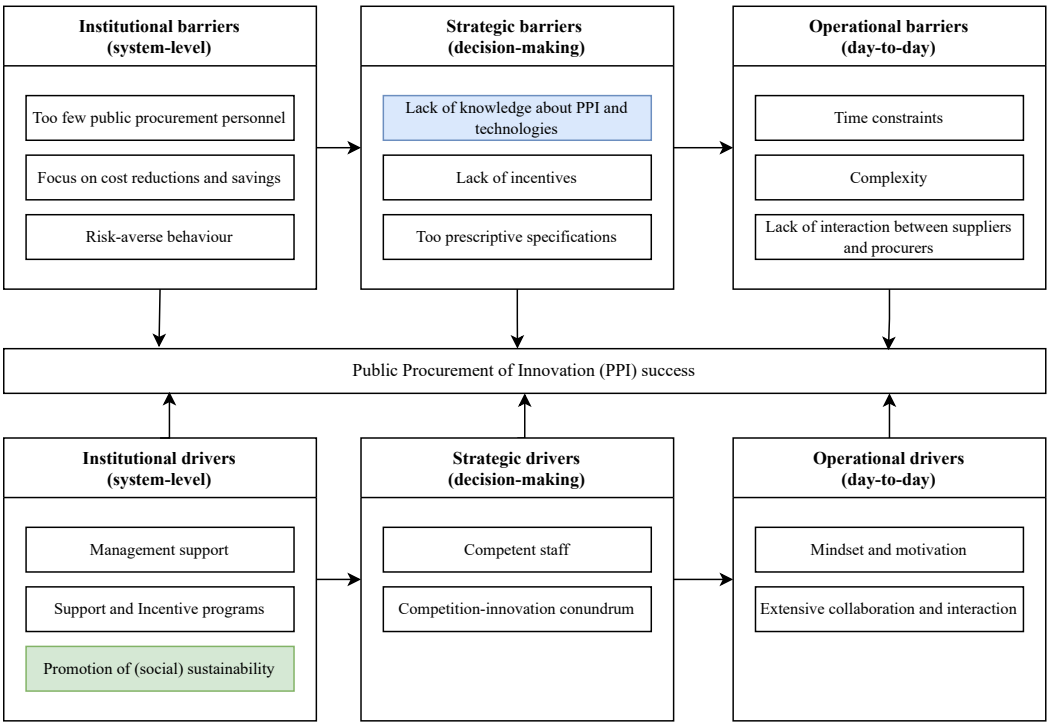


Figure 5.1: Barriers and Drivers to Public Procurement of Innovation

The results of this thesis align with the hypotheses formulated in Chapter 3. Interestingly, all of them are confirmed. This indicates that the literature provides a clear overview of the barriers and drivers associated with public procurement of innovation and that organisations continue to perceive the same barriers and drivers as relevant.

The results are structured in the same manner as described by Bocken and Geradts (2020). Institutional barriers and drivers influence strategic barriers and drivers, which, in turn, affect operational barriers and drivers. While different classification approaches were possible, presenting the results in this way highlights the directional flow of the barriers and drivers.

The two coloured blocks indicate necessary conditions, as outlined in the quantitative results section. An organisation cannot have an efficient procurement process if there is a lack of knowledge. Similarly, the promotion of social sustainability is a necessary condition for stakeholder satisfaction.

## 5.5 Enablers of public procurement of innovation

Besides the barriers and drivers of public procurement of innovation, there are also enablers that were discussed in the interviews, among other sources. Unlike drivers, which motivate a process forward, and barriers, which hinder a process, enablers are factors that help to remove barriers or support and activate drivers. The most important enablers are discussed below.

### 5.5.1 Business case

To overcome the barriers associated with a focus on cost reductions and savings, it can be helpful to build a business case to understand the value of the project an organisation is working on (I5). A value engineer can support both the procuring organisation and the suppliers in demonstrating the value of the solution. There is often no immediate return on investment, and as mentioned earlier, it is important to consider the total cost of ownership and lifecycle costs (I1). As one participant noted:

> *"One of the main reasons why you should work on innovation procurement is because it carries a significant potential for cost reduction if you're willing to look at the cost element in a different way [...] Because money sort of paves the way for acceptance, we have a lot of focus on cost-benefit analysis in our projects, and if you have a cost reduction aspect that's been estimated, it's a lot easier to get a sort of stamp and a green light to carry on with that project"* (I3).

Understanding the financial benefits in the long term is therefore useful not only in overcoming the barrier of a narrow focus on cost reductions but also in addressing the risk-averse behaviour of people within the organisation.

### 5.5.2 Knowledge management

One of the most important factors is (the lack of) knowledge, which serves as both a limiting and driving factor in PPI. Therefore, it is crucial to continuously develop the necessary competences. However, it is challenging for organisations to learn more about PPI, as most have had limited experience with innovation procedures.

As a result, one of the interview participants suggested that sharing information at events, such as conferences, would be valuable for providing more in-depth insights:

> *"I mainly looked at other organisations that had previous experience with this. Right now, we are working on organising a mini-conference on the innovation partnership [...] This is also related to our search for subject matter experts who have dealt with this before."* (I5)

### 5.5.3 Preliminary market consultations

Another important enabler, particularly in overcoming the barrier of lack of interaction and support, and a key driver of extensive collaboration and engagement, is pre-market consultation. Many procuring organisations are risk-averse and fear that they are not permitted to engage with the market. However, Directive 2014/24/EU allows contracting authorities to conduct market consultations before initiating a tender. As long as the process is well-documented to ensure transparency and objectivity, there is no issue. Contracting authorities should be made aware of this. As one participant noted, pre-market consultations actually facilitate more innovative solutions and help define more functional specifications:

> *"Since 2014, a preliminary market consultation has provided an opportunity to meet market players, publish drafts, and even seek their opinions on the terms and conditions as well as the technical specifications. When considering an AI solution and how to integrate AI into an organisation's operations, there is no single model or one-size-fits-all approach. Instead, various solutions should be explored. If a contracting authority is open to alternative bids, it is their responsibility to determine how to differentiate between the alternatives. This approach is innovative because it allows the contracting authority to enable market players to offer different kinds of solutions, ultimately leading to a higher impact."* (I7)

There are different ways to facilitate interaction between companies and procuring organisations. The most common approach is a Request for Information (RFI), but other possibilities include workshops or direct consultations:

> *"We always organise open market consultations. This means that any company interested in participating is welcome to join. We generally do not select companies ourselves but announce the consultation well in advance via Tendernet [...] Most organisations either contact a few companies directly or send out a Request for Information (RFI) to collect written input. However, we typically organise our consultations as workshop-style sessions, either in the morning or the afternoon."* (I1)

### 5.5.4 Create a sense of urgency

Another important enabler of PPI is urgency, which is the need for change. This is particularly evident in the IT sector, where continuous innovation is essential. Falling behind can have significant consequences:

- *"I work a lot in the ICT sector, where innovation is deeply embedded. The entire ICT, AI, and IT world is driven by innovation. In this field, it's simply a necessity—because if you don't keep up, at some point, you'll be left behind."* (I8)

It would be valuable to examine how industries like these create a sense of urgency. As another participant noted, urgency helps to drive progress:

> *"The focus is on urgency—either creating or emphasising it. It is essential to provide a great deal of clarity by starting with: why are we actually doing this? Ensuring that those involved are actively engaged is crucial. Then, systematically and clearly outlining the steps: this is how we will approach it, and these are the moments when you can decide whether or not to proceed."* (I10)

It is essential that people recognise innovation as a necessary response to labour shortages and rising costs.

### 5.5.5 Innovation ecosystem

Finally, an important enabler is the innovation ecosystem. Rather than focusing solely on changing the organisation from within, external factors also play a significant role. Cities with a vibrant startup scene or strong university presence are more inclined to adopt innovative procedures. This aligns with the Triple or Quadruple-Helix theory, which emphasises collaboration with various stakeholders. As one participant noted:

> *"And then we see that, depending on the local mix of suppliers and/or academia, cities with a lively startup scene and universities are more inclined to work with GovTech or engage in innovation. This is because it also enhances their attractiveness as a public sector client."* (I3)

Immersing yourself in the ecosystem can help drive the competition-innovation conundrum.

# 6

# Discussion

## 6.1 Reflection on the results

The findings from the previous chapter provide valuable insights into the barriers and drivers of PPI, as well as the necessary conditions for its success. However, the results from the quantitative analysis were not entirely supported by the interviews and, in some ways, contradict the qualitative findings. This raises the question of how these opposing results can be explained.

One possible explanation lies in the quality of the dataset used for the quantitative analysis. Since there is no clear information about the exact population that completed the questionnaire, it is difficult to determine the true reliability of these results. Consequently, greater emphasis has been placed on the findings from the qualitative research.

Nonetheless, certain interesting findings call for further exploration in future studies. Some participants acknowledged that the efficient and effective use of budget is an important driver of PPI. However, as the majority did not support this view, it was excluded. Despite this, the quantitative results suggest that budget efficiency is a necessary condition for PPI success. It is possible that survey respondents interpreted this factor differently from interview participants, making it an area worth investigating further, especially due to the strong effect sizes of this variable.

## 6.2 Theoretical contributions

From a theoretical perspective, this thesis has contributed to various areas, particularly in terms of the methodologies used, the synthesis of literature on PPI, and the understanding of the role that PPI plays in an innovation ecosystem. The academic contributions are as follows:

1. **Synthesising literature**: This thesis conducted a SLR on the barriers and drivers of public procurement of innovation. In doing so, it builds on previous literature reviews by Kundu et al. (2020), Obwegeser and Muller (2018), and Lenderink et al. (2022), which focused on the rationales and approaches of PPI. However, these

earlier reviews did not extensively discuss barriers and drivers. This thesis fills that gap by offering a comprehensive synthesis of factors that enable or hinder PPI implementation.

2. **Methodological approach**: This thesis adopts a novel mixed-method approach, integrating qualitative and quantitative methods to explore the conditions necessary for PPI success. The use of NCA provides a new perspective by identifying the factors that must be present for successful PPI projects. Moreover, the combination of survey data, case study presentations, and expert interviews enhances the robustness of the findings and offers deeper insights into how PPI can succeed.

3. **PPI in relation to IST**: Finally, this thesis applies IST as a theoretical lens to explore how the broader ecosystem influences PPI. The findings clearly show that PPI is embedded within a larger institutional framework and demonstrate, similar to previous studies, that PPI should be viewed as an interconnected system rather than an isolated policy tool.

## 6.3 Practical contributions

This thesis provides public organisations with actionable insights to enhance the effectiveness of PPI. The main contributions are as follows:

1. **International perspective on PPI**: This thesis examines the barriers and drivers of PPI across various countries, primarily within the OECD and EEA contexts, and explores the mitigating actions taken to overcome these challenges. By offering a comparative analysis, this research helps organisations reflect on their own PPI procedures and identify areas for improvement. Moreover, from a European policy perspective, the findings serve as a valuable starting point for policymakers to reconsider incentive structures and strategies to enhance the use of PPI. While the EU is already working on refining procurement directives to facilitate the adoption of PPI, the results of this research suggest that regulations are not necessarily perceived as a primary barrier and it would be advised to look at other barriers as well.

2. **Policy changes to mitigate risk aversion**: The findings reveal that risk-averse behaviour is a major barrier to the adoption of PPI. This thesis proposes the implementation of incentive structures to encourage procurement officials to take calculated risks. By partially covering expenses or offering financial safeguards, procurement professionals and their management may feel more at ease when engaging in PPI. Additionally, reducing perceived financial risks can facilitate stronger (political) management support, which has been identified as a major driver of successful PPI implementation.

3. **Improving quality through early engagement**: One of the main drivers of PPI is extensive collaboration and communication with suppliers. However, many procurers hesitate to engage with suppliers due to concerns about regulatory compliance. This thesis highlights that, when conducted transparently, pre-market consultations are a powerful driver of innovation. Such consultations provide public organisations with the opportunity to ask suppliers critical questions, while suppliers can offer valuable recommendations and innovative ideas. By fostering open and structured dialogue, procurement agencies can ensure that their specifications align with market capabilities, ultimately improving the quality and success of PPI initiatives.

## 6.4 Limitations

Despite the valuable results of this thesis, several limitations exist regarding the methodology, data collection and interpretations. The limitations are summarised below:

1. **International generalisability**: While this study explores the different barriers and drivers of PPI across several countries, the data points are primarily from OECD countries, specifically within the EEA context. The initial results from the IRSPP conference focus on OECD countries, while the interview participants all reside in EEA countries. Consequently, the findings may not be fully applicable to countries outside these contexts. This is particularly relevant in the case of regulatory frameworks, as procurement regulations in Europe differ significantly from those in other regions. Furthermore, economic and institutional environments influence PPI adoption. Some excluded results from the IRSPP study (i.e., countries outside the OECD) indicate that factors such as corruption or environmental challenges (e.g., earthquakes) play a more significant role in those contexts.

2. **Data quality**: While the interview data was collected by the researcher, the IRSPP data was gathered prior to this study. As a result, the data quality cannot be fully guaranteed. A group of researchers was responsible for formulating the questions and documenting the information, but for the purposes of this study, a slightly different approach to questioning could have been beneficial. This means that the survey could be formulated based on the outcomes of the literature review.

3. **Quantitative analysis**: A cluster analysis was conducted to identify potential groups among survey respondents. However, the data lacked key differentiators, such as demographics or procurement experience, making it difficult to determine the value of clustering. As a result, the clustering process may be considered arbitrary and potentially unnecessary. This issue was only raised after the analysis had been completed. From a research perspective, conducting a new analysis at this stage would not be ethical. Consequently, the results of the quantitative analysis should

be interpreted with some caution. That said, the clustering process excluded only 12 participants, so its overall impact is likely to be minimal.

4. **Interpretation of results**: As this study follows a mixed-methods approach, integrating both qualitative and quantitative results involves an interpretative process. Different researchers might interpret the findings in alternative ways, placing greater emphasis on certain results over others. The balance between research approaches may have influenced the depth and direction of specific findings.

5. **Focus on barriers and drivers**: The primary focus of this thesis is to identify the barriers and drivers of PPI adoption. While some recommendations are provided, this study does not offer an in-depth analysis of the real-world implementation of PPI procedures. Further research is needed to examine how these barriers and drivers influence procurement outcomes in practice.

## 6.5 Future work

Building on the limitations outlined above and the findings of this research, several directions for future research could be explored:

1. **Extending the international scope**: As indicated in the limitations, the results of this study are primarily focused on countries within the OECD and EEA contexts. Examining the barriers and drivers of PPI in countries outside these regions could provide valuable insights. Such research may also uncover new mitigating measures that could be relevant for the countries analysed in this study.

2. **Comparative case studies**: Analysing best practices in countries or organisations that have successfully implemented PPI and identifying the key factors that contributed to their success could serve as a blueprint for other organisations. A comparative study across different governance structures and procurement models would further enrich the understanding of effective PPI adoption.

3. **Roadmap for PPI implementation**: Future research could focus on designing a structured implementation framework to guide public organisations in adopting PPI more effectively. While competence centres and organisations have developed fact sheets and guidelines, there is currently no comprehensive, systematic framework in the academic literature that provides a step-by-step approach to PPI implementation. Developing such a framework could bridge the gap between theory and practice.

4. **Integration of sustainability and social value**: Green public procurement is an emerging field, and future research could explore how sustainability considerations can be better integrated into PPI. Investigating the interplay between innovation

procurement and environmental or social impact objectives would provide policymakers and procurement officials with valuable guidance on aligning PPI with broader sustainability goals.

### 6.5.1 Innovation System approach

As discussed in Chapter 2, innovation theory offers a valuable framework for analysing the results within the broader innovation ecosystem. To strengthen this ecosystem, it is essential to identify which aspects require the most attention.

One key area is knowledge development (Function 2), where 'learning by searching' and 'learning by doing' play crucial roles. Research findings indicate that individuals become more comfortable with innovative procurement procedures after experiencing them at least once. This highlights the importance of fostering experimentation, as hands-on experience can significantly improve confidence and competence in managing such processes. Therefore, the recommendation is to focus on promoting experimentation to enhance familiarity with these procedures.

Overall, the results suggest that greater attention should be given to the Creation of Legitimacy (Function 7) and Knowledge Development (Function 2), while Entrepreneurial Activities (Function 1) have already been addressed in greater detail.

# 7

# Conclusion

As PPI continues to gain traction, particularly due to geopolitical discussions surrounding technological innovations, understanding the international factors that drive or hinder its success is crucial for shaping organisational, national, and supra-national policy.

This thesis aimed to develop a better understanding of the barriers and drivers in an international context. To address this, the study sought to answer the following research question:

> *What factors drive and hinder the adoption of public procurement of innovation, and how can these challenges be addressed?*

The findings underscore that while early supplier engagement through market consultations, incentive programmes, and management support serve as enablers, barriers such as risk aversion and overly prescriptive specifications hinder PPI success.

A key contribution of this study is the development of a framework that illustrates the barriers and drivers within a broader innovation ecosystem. By categorising these factors and providing recommendations, the framework offers actionable insights that can guide further research and support practitioners.

In conclusion, the findings of this thesis highlight that successful PPI implementation requires more than an update to procurement regulations; it necessitates a cultural shift within organisations, demonstrating a willingness to embrace change and tackle societal challenges through innovation. Addressing these challenges can unlock the full potential of PPI, ensuring that public procurement serves as a catalyst for innovation.

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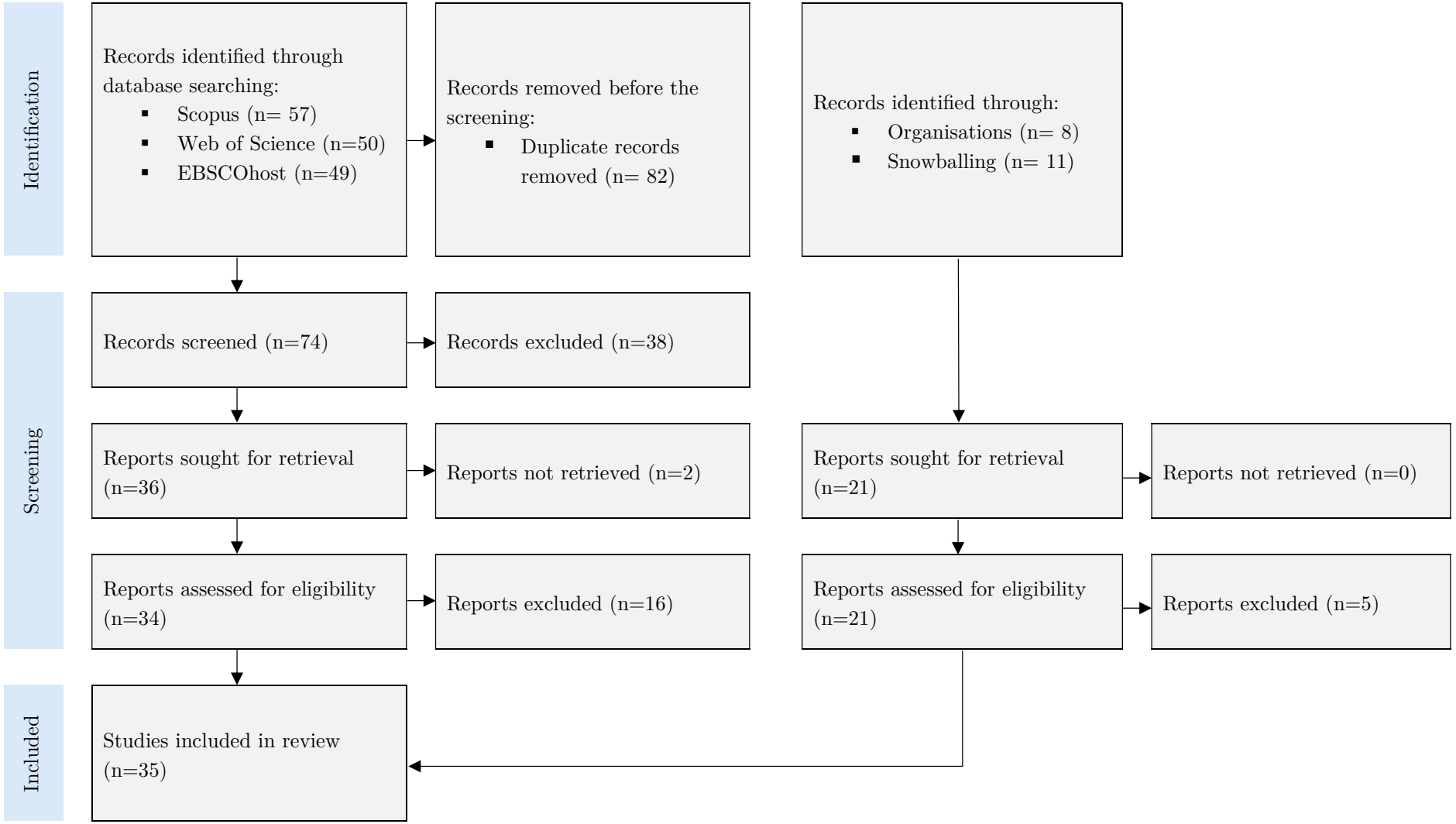
# A

# PRISMA FLOW CHART


Identification
Records identified through database searching:
Scopus (n= 57)
Web of Science (n=50)
EBSCOhost (n=49)
Records removed before the screening:
Duplicate records removed (n= 82)
Records identified through:
Organisations (n= 8)
Snowballing (n= 11)
Screening
Records screened (n=74)
Records excluded (n=38)
Reports sought for retrieval (n=36)
Reports not retrieved (n=2)
Reports sought for retrieval (n=21)
Reports not retrieved (n=0)
Reports assessed for eligibility (n=34)
Reports excluded (n=16)
Reports assessed for eligibility (n=21)
Reports excluded (n=5)
Included
Studies included in review (n=35)

# B

# Principal component analysis

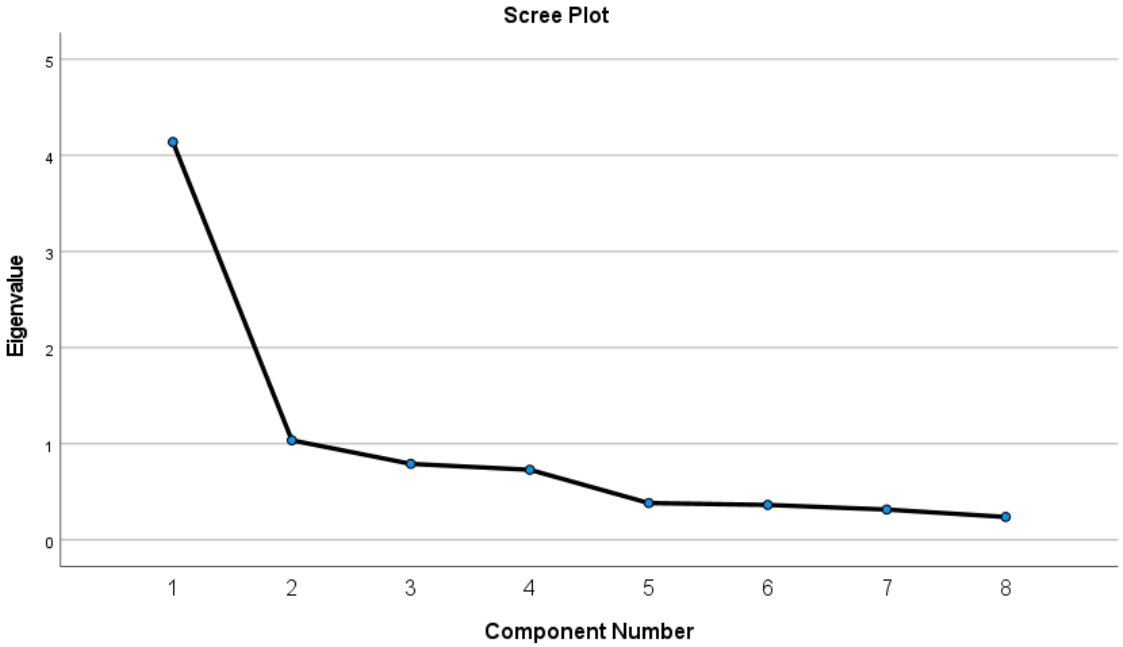



Figure B.1: Scree plot

| | 1 | 2 |
|---|---|---|
| DV: Improvement of the environmental sustainability | ,812 | |
| DV: Improvement in the satisfaction of end user needs | ,717 | |
| DV: Improvement in the competences of actors involved in the procurement process | ,708 | |
| DV: Improvement in the quality of the procurement process for the innovative good/service | ,695 | |
| DV: Reduction of supplier risk in the procurement process | ,606 | |
| DV: Increase of transparency of the process in which the good/service has been included | ,606 | |
| DV: Reduction of the costs of the procurement process | | -,890 |
| DV: Simplification of the procurement process in which the good/service has been included | | -,665 |

Table B.1: Pattern matrix

# C

# Excluded variables

| Model | Beta | t | Sig. | VIF |
|---|---|---|---|---|
| IV1: Support to small-medium enterprises | ,097 | 1,217 | ,226 | ,695 |
| IV1: Collaboration with national and international bodies | ,112 | 1,540 | ,126 | ,837 |
| IV2: Too few public procurement personnel | -,022 | -,340 | ,735 | ,754 |
| IV2: Lack of knowledge of government innovation policies | ,033 | ,496 | ,621 | ,872 |
| IV2: Lack of knowledge of innovation capacity and capability in the supply market | ,053 | ,775 | ,440 | ,700 |
| IV2: Public procurement regulations | -,089 | -1,269 | ,207 | ,833 |
| IV2: Late involvement in innovation projects | ,029 | ,430 | ,668 | ,732 |
| IV2: Government involves public procurement in innovation policy making | -,084 | -1,234 | ,220 | ,843 |
| IV2: Government mandates that public procurement contracts must stimulate innovation | ,058 | ,844 | ,401 | ,833 |
| IV2: Government sets targets for public procurement to let a proportion of contracts to innovative start-ups | -,040 | -,603 | ,548 | ,853 |
| IV2: Government provides website or online support for public procurement of innovation -,079 | -1,157 | ,250 | ,783 | |
| IV2: Government departments send communications to public procurement about their innovation policies | -,126 | -1,887 | ,062 | ,751 |
| IV1: Promotion of environmental sustainability (e.g. reduction of pollution, environment preservation) | ,101 | 1,474 | ,143 | ,699 |

Table C.1: Excluded variables procurement process efficiency

| Model | Beta | t | Sig. | VIF |
|---|---|---|---|---|
| IV1: Promotion of environmental sustainability (e.g. reduction of pollution, environment preservation) | ,101 | 1,474 | ,143 | ,630 |
| IV1: Support to small-medium enterprises | ,097 | 1,217 | ,226 | ,747 |
| IV1: Collaboration with national and international bodies | ,112 | 1,540 | ,126 | ,931 |
| IV2: Too few public procurement personnel | -,022 | -,340 | ,735 | ,922 |
| IV2: Lack of knowledge of government innovation policies | ,033 | ,496 | ,621 | ,846 |
| IV2: Lack of knowledge of innovation capacity and capability in the supply market | ,053 | ,775 | ,440 | ,810 |
| IV2: Public procurement regulations | -,089 | -1,269 | ,207 | ,876 |

| | | | | |
|---|---|---|---|---|
| IV2: Late involvement in innovation projects | ,029 | ,430 | ,668 | ,866 |
| IV2: Government involves public procurement in innovation policy making | -,084 | -1,234 | ,220 | ,839 |
| IV2: Government mandates that public procurement contracts must stimulate innovation | ,058 | ,844 | ,401 | ,892 |
| IV2: Government sets targets for public procurement to let a proportion of contracts to innovative start-ups | -,040 | -,603 | ,548 | ,858 |
| IV2: Government provides website or online support for public procurement of innovation | -,079 | -1,157 | ,250 | ,881 |
| IV2: Government departments send communications to public procurement about their innovation policies | -,126 | -1,887 | ,062 | ,852 |

Table C.2: Excluded variables supplier satisfaction

# D

# Interview Protocol

## D.1 Objective

To validate the barriers and drivers of Public Procurement of Innovation (PPI) identified in the research.

## D.2 Format

- Semi-structured interview (flexibility for discussion).
- **Duration**: 30 minutes.

## D.3 Section 1: Introduction

- Briefly introduce yourself and the purpose of the study.
- Explain confidentiality and consent (optional recording, anonymity).
- Ask the participant to introduce themselves:
  - Name (optional), role, organisation.
  - Experience with PPI (years, specific projects, policy involvement).

## D.4 Section 2: General view on PPI

- What key factors do you believe drive or hinder PPI adoption?

## D.5 Section 3: Validation of Barriers & Drivers

### D.5.1 Barriers to PPI Implementation

- From your experience, which of these barriers are most critical?

  - Risk-aversive behaviour
  - Too prescriptive specifications
  - Lack of interaction between supplier
  - Regulations
  - Focus on cost reductions and savings
- Are there any other major barriers you have encountered?
- What mitigating actions can be taken to overcome these barriers?

### D.5.2 Drivers of Successful PPI

- Which of these drivers are most important for PPI success?
  - Extensive collaboration and interaction
  - Competent staff
  - Collaboration with (inter)national bodies
  - Promotion of social sustainability
  - Efficient and effective use of spending budget
  - Support to SMEs
  - Growth of local economy and employment creation
  - Stimulation of innovation
- Are there any other key enablers that should be considered?

# E

# Identified barriers and drivers

Index for the overview

| # | Description |
|---|---|
| 1 | Systematic Literature Review |
| 2 | Quantitative Analysis IRSPP data |
| 3 | Qualitative Analysis IRSPP data |
| 4 | Interviews |
| 5 | Included Items |

Table E.1: Index for identified barriers and drivers

| Factor | Type | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Lack of interaction between suppliers and procurers | Barrier | X | | | X | X |
| Lack of knowledge about PPI and technologies | Barrier | X | X | X | X | X |
| Time constraints | Barrier | X | | | X | X |
| Lack of incentives | Barrier | X | | | | X |
| Too prescriptive specifications | Barrier | X | | X | X | X |
| Risk-averse behaviour | Barrier | X | | X | X | X |
| Focus on cost reductions and savings (Financial) | Barrier | X | X | X | X | X |
| Complexity | Barrier | X | | | X | X |
| Too few public procurement personnel | Barrier | | X | X | X | X |
| Extensive collaboration and interaction | Driver | X | | X | X | X |
| Competition-innovation conundrum | Driver | X | | | | X |
| Competent staff | Driver | X | | | X | X |
| Political and technical champions / Management support | Driver | X | | X | X | X |
| Support and incentive programmes | Driver | X | | | X | X |
| Promotion of social sustainability | Driver | | X | | X | X |
| Motivation and Mindset | Driver | | | | X | X |

| | | | | |
|---|---|---|---|---|
| Contract issues (length, size and formulation) | Barrier | X | | |
| Lack of openness to new ideas | Barrier | X | | |
| Political interference | Barrier | X | | |
| Regulations | Barrier | X | X | |
| Lack of a champion | Barrier | X | | |
| Organised scepticism | Barrier | X | | X |
| Fragmentation | Barrier | X | | |
| Lack of competition | Barrier | X | | |
| Complexity | Barrier | X | | |
| Early engagement | Driver | X | | |
| Institutional match | Driver | X | | |
| Collaboration with (inter)national bodies | Driver | | X | |
| Outcome-based specifications | Driver | X | | |
| Efficient and effective use of spending budget | Driver | | X | |
| Stimulation of innovation | Driver | | X | |
| Growth of local economy | Driver | | X | |
| Support to SMEs | Driver | | X | |

Table E.2: Identified barriers and drivers